

THE DENTAL PRACTITIONER

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THE DENTAL PRACTITIONER AND DENTAL RECORD

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EDITORIAL

NIGERIA

DURING the past few weeks attention has been focused on the West African country of Nigeria. It is a country that has made great strides in recent years and is on the verge of a great future for itself. Any country that makes such rapid growth politically and socially is bound to be confronted by problems of a diverse nature. Two basic problems that have always to be faced are those of health and education. From all accounts the Nigerian people have a natural desire for higher education, and it is possible that this fortunate characteristic is responsible for their rapid advancement and attainments. It is only through education that highly qualified and trained members of society can build a new nation. The University College at Ibadan, which is in special relationship to the University of London, has a growing medical school which is training at a high level of medical education the future medical profession of the country. It is unfortunate to say the least that hand in hand with this scheme there is no dental school in Nigeria. This lack of a Nigerian dental profession will undoubtedly upset the balance of any health measures that are taken by the government. There are tremendous dental problems in this part of the world, and readers will

recall an article written on the Colonial Dental Service in Sierra Leone in the February issue of this journal last year. These problems will never be solved until the people of Africa have their own university faculties for dental surgery, and train their own people to serve in this branch of the health services. All too often dental health has lagged behind the other medical services, with the ultimate consequences that the dental profession when fully equipped is thought to be inferior to the main branch because of its late arrival. The impression is created that as the problem of dental health is dealt with as of secondary importance, then the dental profession itself is of secondary importance. This is quite the wrong attitude, and any nation wishing to build up its health services must commence its dental programme at the same time as the creation of all the health services. It is sincerely hoped that the Nigerian people will not let this opportunity slip and will constitute a new dental school as soon as possible within the University College and alongside their medical school. They can be assured that the dental profession in this country and the Colonial Dental Service will do all in its power to help in such a worthwhile project for the future well-being of Nigeria.

BRIDGES*

WITH PARTICULAR RELATION TO THE PERIODONTAL TISSUES

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ALTHOUGH the title of this paper may perhaps have the hidden implication that the viewpoints of periodontologist and crown-and-bridge worker may be somewhat different, it is suggested that, on the contrary, they are identical. For surely, both desire that a bridge, once it is placed in the mouth, should be retained there, and, being retained, should remain in a healthy state.

This applies, of course, both to periodontal splints placed for the treatment of specific periodontal lesions and to bridges constructed on a more or less healthy foundation restoring gaps for reasons of aesthetics or occlusion. On occasions, however, the bridge is extended to cover some of the functions of the splint, but it is not the intention to deal here with splints which are placed primarily as therapeutic measures. The main purpose of this paper is to consider the periodontal implications of routine bridgework constructed to restore gaps in the natural healthy dentition.

First of all, one would like to discuss the principles upon which the Department of Conservative Dentistry at this Institute has been basing its teaching and practice of bridgework in the past few years and where since 1950 some 400 bridges have been constructed. Here it may be pointed out that the principles which will be mentioned and the conclusions which one will attempt to draw from the experiences of the Department are not so much the author's own personal ideas, but are an attempt to represent the consensus of opinion of past and present members of the staff of the Department. They have been engaged both in the construction of bridges themselves and in the supervision of the making of many more by postgraduate students. In considering these principles, it is intended to discuss the preliminary choice at diagnosis, the place of

fixed-fixed, fixed-movable, and cantilever types of bridges, and also to mention the types of retainers and pontics used. Subsequently, an assessment will be attempted of the success or otherwise of the principles and practice described.

DIAGNOSIS

A preliminary diagnosis and assessment of the case from clinical examination, study models, and X rays is of prime importance, and it is a useful exercise to remind oneself at this time that there are, for any given gap in the dentition, at least three lines of treatment and possibly, especially in the younger patient, four possible alternatives.

This extra, and perhaps first, consideration in the younger patient is the possibility of orthodontic movement of teeth to close or partially close the gap: or to place the gap farther distally, where aesthetic prosthesis may be easier and more effective. By moving a lateral incisor forward into a central space and subsequent crowning with porcelain, for instance, a reasonably aesthetic, longer lasting, and more healthy final result may often be secured. Even in the not-so-young adult, orthodontic movement prior to bridgework may pay dividends, as in the case where there is mesial movement of the upper second molar away from the third, after extraction of the first molar, which has resulted in gingivitis due to food impaction, combined with recession and sensitivity. Here, orthodontic treatment can quickly move the second molar back into contact and a fixed bridge be placed to retain the molar in position, pain and discomfort being eliminated.

However, for the average case there are three alternatives: In the first place, the space can be left alone; secondly, it can be filled with a partial denture; and, lastly, it may be possible to replace the missing teeth with a bridge.

* A paper given to the British Society of Periodontology at the Eastman Dental Hospital on December 5, 1955.

Now there is probably so fixed in one's mind the picture of horrible periodontal and cariogenic results which may be the sequelae of the extraction of, for example, a lower first molar in an otherwise intact dentition, that it may be easy to lose sight of the fact that in a dentition where the dental arches, or segments of the arches, are in poor relationship, the loss of a tooth may not result in any significant derangement of the occlusion subsequently because of cuspal locking. This may also apply, of course, to cases where teeth have been missing elsewhere in the arch prior to the latest casualty, or where the case presents with long-standing gaps. Here, in spite of the unorthodox occlusion, there may be nevertheless an equilibrium which really does not warrant interference. Masterly inactivity can be considered the preferential line of treatment, although more active measures may be necessary owing to the pressure of aesthetics.

The decision is now between a partial denture and a bridge, and these two are more often the only real alternatives. Unfortunately, neither is a perfect state of affairs, but such may be the variations between a bad acrylic denture and a good cast skeleton denture, that, in fact, there is in a given case, a range within the denture choice from something which may be far worse than a bridge to something which may be as good in every way or even more desirable. The insertion of an all-extensive acrylic partial denture may cause such deterioration of the periodontal tissues that it would be far better to leave the space alone. This is not the place to discuss possible modifications of the partial denture such as the "spoon" type. Nor is it the place to ruminate upon the possible cariogenic propensities of some of the more elaborate cast chrome alloy prostheses, in spite of their tooth-born periodontal advantages. But, given the situation where it is possible to have either a well-constructed denture causing the minimum of periodontal trauma, or a bridge, what are the factors which influence the decision? They are many, and are interdependent. Consideration will not here be given to the patient's attitude, important though it is.

Aesthetics may be an important and the deciding factor. Nor is it necessary now to consider in detail the presence of other spaces in the arches which may require filling. Provided there are enough suitable abutment teeth there is no limit in theory to the number of bridges which can be placed in a patient's mouth. Economics and the endurance of patient and dental surgeon are, usually, the deciding factors. A major consideration, however, related to the number of missing teeth, is the likelihood of other teeth in the arch lasting, and here it might merely be noted that the life of periodontally doubtful teeth adjacent to the abutments may have their life prolonged by incorporating them into the bridge, which thus becomes a combination of bridge and splint.

Narrowing the field to the consideration of the possible abutment teeth themselves, a number of factors present. Foremost will be the question, is it possible to construct a suitable bridge retainer on this tooth? Much will depend on the degree of eruption and the length of the clinical crown available for preparation. In the older patient, or where periodontal disease has resulted in recession, the chances of good retention for the bridge are actually increased, but the amount of periodontal support must be carefully assessed. Periodontal support is a combination of the length and shape of the root within the bone and the degree of mobility of the tooth, which latter is, perhaps, the more important factor. The degree of density of the bone itself as revealed in an X-ray is not considered by the author to be of very great significance. Undergraduate teaching used to emphasize that only sound teeth should be used as bridge abutments. Now, it is considered that a periodontally weak tooth properly treated may still play its part in the arch if supported by an adjacent sound tooth incorporated into the bridge as an additional abutment. However, too weak a tooth may well be a future liability and should be removed.

Tilted teeth often present a problem difficult to treat from the mechanical point of view and yet they are indicative of a degenerating occlusion which an attempt should be made to

arrest and correct if possible. This can be done by either fixed-fixed or fixed-movable bridges, and the occlusion often greatly improved at the same time. The author has an impression that some of these cases occasionally present persistent discomfort on heavy chewing for some considerable time after placing of the



Fig. 1.—Palatal view of two spring bridges replacing $\overline{11}$.

bridge, and it is thought that this occurs more in the fixed-fixed type of restoration, but the explanation is not at all clear.

A slight digression might be made here, to say that a devitalized tooth successfully treated is not regarded as unsuitable for use as a bridge abutment. Many successful bridges have been constructed using post crown abutments and they seem to stand the additional stresses as well as a normal tooth.

The mention of additional stresses brings to mind the consideration of length of span between abutment teeth. The question is often asked of the maximum span which can be bridged. Normally, this is considered to be the length of two molar teeth, but in exceptional circumstances, given strongly supported well-formed teeth, it may be possible to bridge the length of the second premolar and first two molars, using the canine and first premolar as anterior abutments, with the third molar as posterior abutment.

INDICATIONS FOR TYPES OF BRIDGES

Having now decided that, in fact, a bridge is possible, there remains to be decided the precise type of bridge to be constructed. In this Institute bridges are classified into cantilever, fixed-movable, and fixed-fixed. The

simple cantilever, where the pontic is slung out from one adjacent retainer and abutment tooth only, is used only after very careful consideration. It is generally well recognized that this can easily be, in fact, merely an aesthetic orthodontic appliance and is justified only where the space to be filled is quite small, and, therefore, the resulting stress on the abutment tooth minimal in relation to its strength. More complex forms of cantilever where two adjacent abutments, fixed together with soldered retainers, supports the pontic, or where a pontic is cantilevered from a fixed-fixed bridge, may be considered a sounder proposition, but the degree of leverage must always be most carefully assessed. The very special case of the spring bridge, which comes under this category of cantilever, may be considered here (Fig. 1). At first sight it might be thought of as a rather undesirable form of prosthesis—very much an orthodontic appliance and a somewhat unhygienic one in addition. But it has been used for many years by competent and exacting practitioners and it was decided to place it among the acceptable types of bridges to be used in the Conservation Department. Its advantages are: (1) Excellent aesthetics, particularly where there are diastemas; (2) Non-mutilation of neighbouring anterior teeth; (3) Use of one abutment only; (4) An inconspicuous retainer usually on a very strong abutment tooth. If the bridge is properly constructed, i.e., with abutment preferably one tooth (certainly not less) away from the pontic and the bar going well up into the palate to form a U-shape, then the stress on the bridge becomes largely tissue-borne. Stress remaining on the abutment has been given a strong palatal component instead of being in a completely mesial direction, as in the simple cantilever. Upper canines seem to be able to stand this labiopalatal direction of force very well if one considers the number of canines there must be in traumatic occlusion and yet remaining in a comparatively healthy periodontal condition.

Some of the fiercest arguments in the field of bridgework have centred around the desirability of using fixed-movable or fixed-fixed types.

Bridgework, up to the first world war, if not completely removable was nearly always fixed-fixed, and then there appears to have been a reaction against this type of work. Hunter (1911) started it by inveighing against fixed bridgework as a cause of focal infection. Chayes, in 1920, extolled the mystic qualities of individual tooth movement. The reaction



Fig. 2.—Posterior fixed-movable bridge showing dovetail attachment.

was, of course, largely against the extensive fixed bridgework which involved routine devitalization for abutment teeth, e.g., "Teeth should practically always be devitalized before being used as abutments for bridges" (Norman Bennett, 1914). Parfitt and Herbert in 1955, under the heading "Fixed Bridges", state that "Extensive bridges supported on pulpless teeth have largely fallen into disrepute on account of the frequency with which the abutment teeth become infected". These words might be interpreted as meaning that extensive fixed bridgework actually caused apical infection of abutments. True, some extensive fixed-bridge cases may present with an appalling gingival condition and extensive apical infection, but it does not follow that this has been caused by adherence to the fixed-fixed principle. The gingival condition is often very obviously connected with poor crown construction and non-cleansable pontics. The failed bridge may well have been built on most unhealthy foundations or to be an indictment of primitive root-canal treatment. Too long a span and thus too great a stress may be a contributing, or even a primary, cause of failure. This may manifest itself as what used to be called "suppurative periodontitis", but may be totally unconnected with the apical

condition. However, it is considered that this still does not invalidate the principle of fixed-fixed bridgework, and one cannot agree with Parfitt and Herbert (1955) when they state that "a disadvantage of the fixed bridge is that it splints the two abutment teeth firmly together so that the periodontal membranes are denied their normal amount of individual

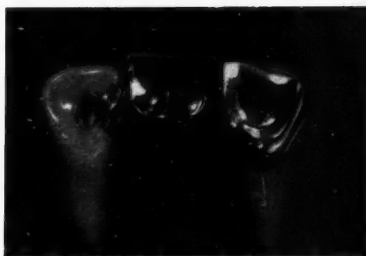


Fig. 3.—Anterior fixed-movable bridge showing attachment in mesial box of Class III inlay.

movement"—a repetition in 1955 of the view of Chayes in 1920. Indeed, a large part of the field of periodontal therapy involves this very splinting together. It may be countered that in periodontal splinting we are treating diseased tissue, as opposed to constructing a bridge on normal healthy tooth abutments. But the underlying principle is very similar in both forms of construction. In the prosthetic bridge the teeth are being asked to bear an additional load, which they are helped to do by fixation. The other case concerns teeth where the load is too much for their weakened foundations, and here splinting spreads the load and enables it to be borne.

Now when the Department of Conservative Dentistry was constituted here at the Institute of Dental Surgery in 1949, having no background of long tradition and teaching, it became necessary to lay down a policy on this question of the degree of fixation. After noting the trend of periodontal teaching generally, the practice of successful operators in this country, and the ideas of some American schools, it was decided to use fixed-fixed bridgework except where contra-indicated by the following three factors: (1) Excessive tilting of teeth; (2) Unattainable equality in strength of abutments; and (3) The requirements of æsthetics.

In practice this has meant that most posterior bridges have been constructed fixed-fixed and that, where abutment teeth have been unequal in strength, as in the case of the lower second premolar and molar, the first premolar has often been brought in as additional support to maintain the fixed-fixed principle. However, in shorter spaces, and particularly in upper premolar spaces where fixed-fixed would have involved considerable display of gold, the principle has been modified to fixed-movable. Similarly, in the anterior region, fixed-movable and spring cantilever bridges have often been the choice for æsthetic reasons.

It might be pointed out here that a properly constructed fixed-movable attachment should be a fairly rigid structure and only allow completely independent movement of one abutment—the minor—into the alveolus. All other movements involve both abutments, but it is probable that the major abutment still receives a major portion of the stress. In the fixed-movable, dovetail attachments are nearly always formed in the axial box portion of the minor retainer (*Fig. 2*) and not across the occlusal or palatal (in the incisors) (*Fig. 3*) in order to avoid torsional stress on the minor abutment.

RETAINERS

For retainers the principle has been adopted that in the average fixed-fixed bridge the three-quarter crown is likely to be the best retainer, although occasionally strong M.O.D. preparations may be adequate if the stress is not too great. A word may be said about the finish of the margins of three-quarter crowns, pinlays, and full gold crowns, which last-named, incidentally, are always cast and not constructed by wrought metal band techniques. Originally, an attempt was made to teach the finishing line, which was supposed to be a cross between the full shoulder of porcelain jacket crown width and the feather-edge slice finish. This gave a definite line to which to finish gold but avoided the heavy destruction of tooth tissue resulting from the formation of a full shoulder. However, the nicety of this preparation is beyond the capabilities of the majority of operators and the so-called

feather-edge finish ending just beneath the free gingival margin has been adopted as standard.

PONTICS

Regarding pontics, a variety of different types has been used over the past few years, with the emphasis shifting latterly to the employment of porcelain types where possible. The prime consideration has been the maintenance of healthy mucosa under the pontic, and with this in mind tissue contact has been kept to a minimum. Glazed porcelain, gold, and acrylic have been graded in that order of desirability as tissue contacts. Thus, the so-called posterior sanitary pontic with no contact has been employed where possible in the lower and, in a few cases, in the upper. Acrylic with gold occlusal and all-acrylic contact was earlier used quite extensively in lower and upper premolar and upper molar regions. This was largely replaced by the gold box with acrylic facing. Here main tissue contact is gold with acrylic buccogingival contact. This has been replaced, now, where possible, with a porcelain pin tooth in a gold box in order to give a mainly porcelain tissue contact (*Fig. 4*). In all these types the pontic contact has been kept to the buccal aspect of the alveolar ridge in an effort to reduce the extent of mucosal contact and has not been brought over the ridge. Where there is sufficient space, a porcelain tube tooth has been utilized for a pontic by giving it a gold occlusal surface (*Fig. 5*). Here, a ridge lap has been allowed, since there is an all-porcelain tissue contact. All these types have been developed because of the lack of satisfactory pontics manufactured in this country.

In the anterior region, acrylic or porcelain jacket-crown types of pontic (*Fig. 6*) with a gold base are frequently used, giving a mainly gold contact with acrylic or porcelain at the labiogingival margin. Gold boxes with acrylic or a porcelain pin tooth, if there is room, are also used, giving the appropriate gingival contact. Steeles type facings are occasionally employed. As with the posterior region, the mucosal contact has been kept as far as possible to the labial aspect of the alveolus.

Wide embrasures (*Fig. 7*) are advocated in the posterior region for assisting hygiene maintenance where not totally contra-indicated because of aesthetics. In the anterior region,

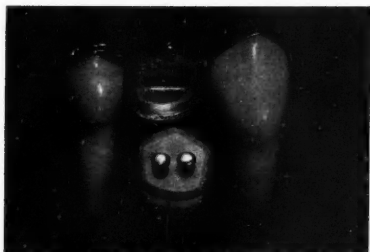


Fig. 4.—Porcelain pin tooth pontic.

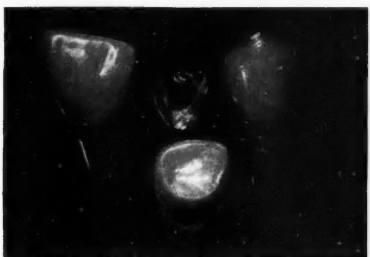


Fig. 6.—Anterior jacket crown pontic.

because of the narrower labiolingual width of the pontic and the greater accessibility to cleansing methods, the embrasures are made as natural as possible.

In the occlusal design of posterior pontics the necessity of keeping the occlusal width narrow has been emphasized in order to avoid undue torsional stress. It might be appropriate at this point to mention that it has not been considered necessary to make the single bridge on a fully adjustable articulator, although these are usually constructed on a small crown-and-bridge articulator, giving a certain amount of lateral movement. It is considered that neighbouring occlusal form gives sufficient guidance for carving to avoid traumatic occlusion in lateral excursion. This is, of course checked in the try-in stage. Multiple bridges, if constructed at one time for occlusal correction, are made with the use of a Dentatus articulator.

FAILURE RATE

In assessing the results of bridgework, and especially the failure rate, it must be remembered that most of the work of the department

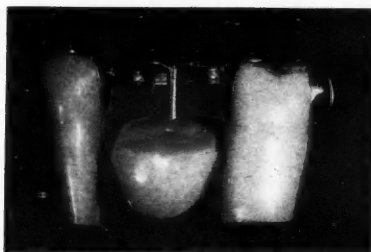


Fig. 5.—Porcelain tube tooth pontic.



Fig. 7.—Bridge showing wide embrasures on either side of pontic to assist hygiene.

has been carried out by postgraduate students, but the degree of supervision, at least over the last two years, has been probably as close, if not closer, than that under which the average undergraduate carries out advanced work. However, much of it will still not match the competence of the best practitioners. Failure is defined as either recurrent caries sufficient to require reconstruction of the abutment, or loosening of the retainer with or without recurrent caries, or breakage requiring reconstruction of the bridge. Reference will now be made to the past two years' work, which is covered by a revised system of recording introduced in December, 1953. It is extremely difficult to deduce conclusive results from the overall figures of these two years, for they involve the results of previous years' work, but in this period 100 posterior, 28 spring, and 52 other anterior bridges were made. Of these bridges 16 posterior, 6 spring, and 5 other

anterior bridges were remakes, giving an apparent failure figure of approximately 16, 21, and 10 per cent respectively, or an average of approximately 15 per cent. But, in these remakes there are some which have lasted

Table I

	Posterior	Spring Anterior	Other Anterior	Total
Made in 1954	75	18	29	122
Failed in 12 months	3	4	3	12
Percentage	4	22	10	8

nearly five years and some which have failed in under a month. All that can be deduced with certainty from two years' total figures is the failure rate after one year. This is set out in Table I.

Making allowance for those failures which do not come back to us, the average failure rate for bridgework might be considered to be at least 10 per cent in the first year—rather a disturbing thought. It is a pity that it has been impossible to carry out at this time research

that the patients mostly had been unaware of the failure until recall. Criteria of failure was as in the previous analysis. It was often difficult to ascertain the precise reason for the failure. One retainer was usually loose, but if there was no recurrent caries it was usually impossible to assign a particular reason. Even if caries was present it was difficult to determine if this was the cause of breaking the cement seal or whether it occurred secondarily. In only one case could it be said that a definite traumatic occlusion was a contributory cause.

This result from a small series bears out the general impression of the experience of the department. Most bridges fail in mechanical retention long before periodontal sequelae have undermined the foundations. More fixed-fixed bridges are constructed, but there still appears to be a greater proportion of fixed-fixed failures. Whether this is due to the more exacting nature of their construction and greater scope for error in cementation, open margins, etc., or whether it is due to the particular inter-action

Table II

	Fixed-fixed	Fixed-movable	Complex	Cantilever	Spring	Total	Reviewed	Failed
Posterior:—								
Reviewed	31	14	4			49		
Failed	5							5
Anterior:—								
Reviewed	6	7		5	7	25		
Failed		2			2			4
						74		9

further back into hospital records in order to attempt to assess failure rates for longer periods. It may be possible to do this at a later date—but one might hazard a guess that at least another 10 per cent of bridges are lost in the next twelve months, and on this basis it would not be surprising to find that 35 per cent of bridges fail to last five years.

A perhaps more instructive review, but little more comforting in result than the previous figures, was a recall check-up on 74 bridges carried out by a member of the departmental staff over the past few months. These are analysed in Table II.

It was again disturbing to note that of this cross-section of bridgework patients, failures detected at review numbered 9, i.e., 12 per cent, but the particular point about this number is

of stresses on the abutments is not certain. But it is felt that the usual conception of what is considered adequate retention should be revised, certainly in the fixed-fixed bridge and possibly throughout the range of bridgework. Thus, greater use may have to be made of pin fixation, particularly in the younger patient with short clinical crowns. Even periodontal splints with no pontic load have been known to come adrift from good retentive abutment preparations for no apparent reason.

GINGIVAL MARGINS

Possibly, if greater retention can be obtained by pins or deeper mesial and distal slices, the lingual wall need not be covered, as in the Krause M.O.D. veneer (1934), or it can be reduced, as advocated by Karlström (1955),

by finishing the three-quarter crown 1 mm. or more above the gingival margin. Karlström claims that in relation to pin fixation, which he uses extensively, the reduced retention caused by the short lingual wall is insignificant and has the advantage that recurrent caries can be more easily observed, and the possibility of gingivitis along this margin is also avoided.

Gingivitis was noted in the survey in relation to either pontics or retainers, mostly retainers, in 18 bridges. It was usually of a minimal degree, but nevertheless present. This may have been due to the irritation of an imperfect edge to the gold and/or a reaction to deposits on the gold, which, in some mouths, may soon lose its polish and accumulate soft calculus. This is, incidentally, often particularly noticeable on the underside of the so-called sanitary pontic, and here it is considered that a tube tooth with porcelain contact may well be generally a more healthy solution.

MOBILITY AND POCKETS

In the series 5 bridges out of 74 showed more than a Class O mobility, although whether that was there before bridge construction is not certain. However, it is recorded that there appeared to be some degree of traumatic occlusion, judging by the appearance of the gold, in 3 cases. In the other 2 cases one showed no obvious cause, although it was a cantilever, and the other was a case of definite chronic periodontitis.

A pocket depth of over 3 mm. around one or other of the abutments was noticed in 12 cases out of 74, although what was the situation prior to placing the bridge is unknown.

TISSUE TOLERANCE

Some of this pocket depth adjacent to pontics often appears to be due to a heaping-up of the gingivæ in the embrasure to make contact with the pontic. This is particularly the case where a space has been left between pontic and mucosa over the crest of the ridge, which, it was hoped, would be self-cleansing whilst giving only a labial contact of the pontic. Here it is probable that, in the effort to avoid one adverse situation, an equally poor condition has been unhappily created, and it may

be considered whether a ridge lap of gold is not possibly to be preferred to a not-so-clean space. In fact, in the spring bridge, where much gold is in permanent tissue contact, the comparatively healthy state of the mucosa on removal of a bridge has occasioned surprise even where the bar shows evidence of deposits on the fitting surface. Incidentally, this is always bedded well down into the resilient palatal tissue by letting the casting into the model quite appreciably except at the gingival crest. The only case where food impaction has caused trouble was where for some obscure reason the rules were contravened and a lateral was slung off a canine with a narrow U-bar.

In relation to tissue contact, the compatibility of acrylic to mucosa is still, as far as can be seen, a matter about which little is known. At first sight the labial edge of the pontic may have a natural appearance, and if there is no discoloration of the acrylic it may be hard to distinguish the pontic, so normal at the gingivæ is the contour of the mucosa. However, coinciding with the pontic contact there may well be on removal an area of ulceration. This is easily explained in some cases by the pontic design, but may occur in spite of the pontic having a really well-polished fitting surface. On the other hand, an indifferently finished pontic may reveal on removal a near normal mucosa beneath it. Whatever may be the mechanism to account for these tissue responses to acrylic, the reaction to porcelain can be regarded as minimal and therefore, as mentioned previously, this material is utilized for pontics wherever possible.

SUMMARY AND CONCLUSIONS

The principles and practice of bridgework as taught in the Department of Conservative Dentistry at the Institute of Dental Surgery has been surveyed with particular reference to the periodontal considerations in planning and execution. A review of the past two years' work and the results of a recall check-up on 74 bridges has been given. An attempted assessment of the failure rate has been made and of the periodontal sequelæ. It would appear that, over the short period of working of the department, adverse periodontal

conditions are not frequent or significant sequelæ to bridgework, and that mechanical failure is a much more important consideration.

Acknowledgements.—Thanks are due to Mr. G. B. Elphicke, Assistant Lecturer to the Department of Conservative Dentistry, for the careful and diligent review of the recall cases; and to other members of the staff of the Department for their help and comment in the writing of this paper; also to the Photographic Department for the illustrations.

DISCUSSION

In opening the discussion Mr. Hamish Thomson said that fair-mindedness and the absence of dogma are the surest defence in debate, and when to this is added a sincere humility in the appraisal of failure one's instinctive reaction is to cross the floor of the house and join forces with the opposition. There is of course no party or opposition on this platform of bridgework and the periodontal tissues. No criteria have been established for determining the success or failure of bridgework in relation to the periodontal tissues, and Mr. Marrant's paper may well prove to be a milestone in this respect. Mr. Thomson was conscious of the frustration Mr. Marrant must have felt in recording that while 5 bridges out of 74 showed more than a Class O mobility no record was available of the mobility before the bridge was made. If mobility was to be a criterion in establishing the success or failure of bridgework it must obviously be recorded before treatment is begun. Similarly pocket depth must be recorded, and also the conditions of the free gingivæ and mucosa of the saddle must be recorded in relation to some standard of normal.

It has been admitted by Mr. Marrant that two years is not a long enough period on which to base conclusions. There must be many in this audience who can speak with the experience of twenty and more years and whose clinical impressions of their bridgework will be of great value, but no conclusions can be given without recorded evidence. Mr. Marrant's venture in this field is, therefore, most praiseworthy and his conclusions will be followed with great interest for our guidance, year by year.

Of interest to this Society will be Mr. Marrant's impression that most bridges fail in mechanical retention long before periodontal sequelæ have undermined the supports for the abutment teeth. Once again it has to be admitted that two years is not a long enough time for this to be a reasoned conclusion, but I should like to support this impression following five years in practice, during which time some two hundred bridges have been made. During the past year some 9 failures have come to light, of which 6 have been due to caries around the abutment teeth, 2 to actual breakage of gold between abutment and pontic, and 1 to periodontal failure. It might be of interest to record that one bridge (fixed between lower left seven and lower left five) was placed five years ago in an effort to support two loose teeth.

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This bridge has shown more mobility, in the last two years, than I feel is good for the periodontal tissues, but these tissues are kept clean by the patient, and the bridge is essentially functional. A plea is therefore made to all who are practising bridgework, and whose evidence would be of value, for a standard of normal tissue condition to be established before treatment, and a method of establishing progress or regress in these tissues over the years. Classification of tissues into periodontal, gingival, and mucosal tissues might be a good beginning.

Mr. Thomson pointed out the limited use made by Mr. Marrant's department of the adjustable articulator in bridgework. He was strongly of the opinion that this articulator is a great help in establishing correct jaw relationships in the making of a bridge; in his practice it is used as a routine the chief reason being that a wax squash-bite on one side only is, at best, a hit-or-miss method of recording the bite. If trauma of a new occlusal surface on mature periodontal tissues is a factor in the lasting qualities of a bridge, then the correct recording of occlusal relationships must receive high priority. The adjustable articulator is a great help in this respect.

Mr. Thomson emphasized the importance of oral hygiene. He felt that if a patient was obviously not interested in this aspect of prevention bridgework should be discouraged. The correct brushing of the gums and the teeth carrying abutments and the use of some form of interdental cleansing (preferably by wood sticks) is the surest way of preventing recurrent caries or periodontal disease round bridgework. Further to this, space must be allowed between abutment and pontic for the insertion of the triangular-shaped wood stick. The incidence of marginal gingivitis and mucosal inflammation can be greatly reduced, if it does exist, by these measures.

Mr. Thomson said that it was a real pleasure to be able to thank an old classmate for a paper which has considerable significance for this Society. He felt, however, that he would perhaps like to throw a small cat among the pigeons by saying that there might be something in the mystical qualities of individual tooth movement, such as is allowed, in part, by fixed-movable bridges. With no evidence whatsoever, though longing for some, he could not help feeling that our periodontal tissues think highly of just a little movement.

A SURVEY OF MALOCCLUSION AND SOME AETIOLOGICAL FACTORS IN 1000 SHEFFIELD SCHOOLCHILDREN*

AN INTERIM REPORT

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ONE way in which our knowledge of malocclusion and its causes is being extended is by the examination of different samples of children. Edward Angle, in 1899, published a table of 1000 cases of malocclusion classified according to the mediobuccal relationship of their dental arches. Since then several surveys have been published of varying numbers of American (Goldstein and Stanton, 1936; McCall, 1944), German (Korkhaus, 1928), Australian (Taylor, 1935), Norwegian (Telle, 1951), English (Selare, 1945; Humphreys and Leighton, 1950), and Irish (Dockrell, Clinch, and Scott, 1955) children. Each of these surveys makes its own contribution to our knowledge of the incidence and nature of malocclusion.

In my own investigations, I have considered malocclusion to be any departure from normal occlusion, which is, in my opinion, severe enough to warrant orthodontic treatment, and I have taken as exhibiting a good normal occlusion any dentition which has good arch form and all teeth in good relation to adjacent as well as to opposing teeth.

Whilst in Sheffield I have had the opportunity of exploring the following points:—

1. The incidence of the different classes of malocclusion in such a city.
2. The incidence of some of the more common known causes of malocclusion.
3. The incidence of those malocclusions which in my opinion require treatment.

A "pilot" survey was commenced on 500 children in 1950 to ascertain the incidence of the different classes of malocclusion only. This first "pilot" survey proved to be inadequate, so in the second trial survey, begun two years later, a more detailed examination was made of the occlusion and some of the

causes of malocclusion were included. About that time the late Miss K. C. Smyth was conducting a similar survey on Middlesex schoolchildren. We accordingly joined forces, established a list of points to be investigated, and also standardized a technique of examination. A 'key' of these points was prepared and slips printed on which the information could be recorded in code at the time of examination, and later transferred to punched cards for ease of sorting. In January, 1953, then, the present survey of 1000 children was commenced.

The school in which this survey was carried out is a county school situated between the city and suburban areas of Sheffield, which has a total population of over 512,000 and a school age population (i.e., 5–15 years) of 75,000. This school includes Boys', Girls', and Infants' Departments teaching children between 5 and 15 years of age and has over 1000 pupils, 6 per cent being from professional, 64 per cent from artisan, and 9 per cent from labouring families. Physically handicapped or mentally retarded children do not attend this school, as special schools are provided elsewhere.

The children examined were from parents who had, for the most part, been in that area of Sheffield all their lives. About 15 per cent of the children had recently moved in from other parts of Britain, but apart from five European families and one Asian family, all were British families.

The examination of the children was carried out in the school premises by the same observer throughout and the information recorded at the time by a clerical assistant. The height and weight of each child and records of any relevant illnesses were taken from the children's school medical cards. The

* Given before the British Society for the Study of Orthodontics, October 10, 1955.

dental history (especially the history of extractions) was obtained from the child and checked where possible against the school clinic dental cards.

The information given by the children about their own habits such as thumb-sucking was found to be unreliable, but the teachers gave quite reliable information about children who

- | | | |
|---|---|-------------------------------------|
| <ul style="list-style-type: none"> b. Teeth unerupted c. Teeth absent d. Extra teeth e. Gross caries. f. Oral hygiene. g. Teeth of abnormal size or shape. h. Fractured teeth. i. Inclined and misplaced teeth. | } | X-rays being taken where necessary. |
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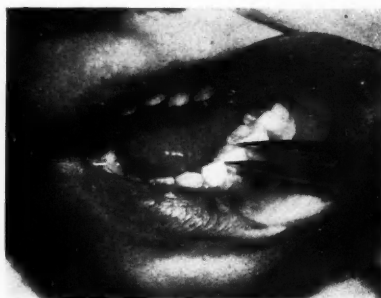


Fig. 1.—Measuring space loss.



indulged in these habits at school. In addition a circular was sent to each parent requesting the previous history of these habits. The appearance of the skin of the digit was also examined for evidence of sucking, and only those cases with a definite history of sucking habits were finally recorded.

The clinical examination of each child consisted of:—

1. Examination of the dentition.
2. Examination of the soft tissues.
3. Examination of the occlusion.
4. Investigation of habits.
5. Assessment of treatment required.

1. Examination of the Dentition.—

- a. Teeth erupted, the stage of eruption, and if deciduous whether firm or loose.

- j. Spacing of teeth and median diastemata.
- k. Crowding of teeth.

l. Drifting of teeth due to the premature loss of neighbouring teeth. (Where drifting had occurred owing to the loss of a neighbouring tooth, a similar tooth, if present on the other side of that arch, was measured across its mediobuccal width and this compared with the reduced space of the affected side (Fig. 1); this reduced space being measured with the specially made internal callipers shown in Fig. 2.)

2. Examination of the Soft Tissues.—

- a. Lips (whether or not habitually apart and whether or not the lower lip lay habitually lingual to the upper incisors).

b. Labial fræna (whether or not blanching was produced in the palate when the frænum was stretched).

- c. Tongue (whether or not thrust forward on swallowing).

d. Thumb and fingers (whether or not the skin on dorsal surface hardened, or the palmar surface wrinkled or the digit twisted).

3. Examination of the Occlusion.—

- a. Anteroposterior: according to Angle's classification. Malrelation between the lower

arch and the upper arch (having first allowed for arch development (Friel, 1954) and the local drifting of teeth following premature extraction) by more than half the mediolateral width of a cusp.

b. *Faciolingu*: to determine whether or not any tooth or teeth were in a cross-bite or linguoocclusion.

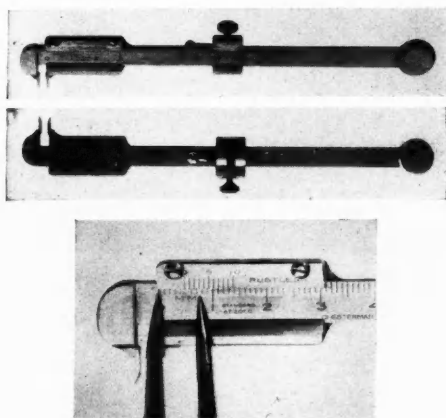


Fig. 2.—Special callipers used.

c. *Vertical*: to establish whether the bite was open, normal, or closed in the incisor region.

4. Investigation of Habits.—

a. Thumb or finger sucking.

c. Whether it could be carried out by an assistant or whether a trained orthodontist was required; or

d. Whether the patient, owing to lack of reasonable interest, extreme caries, or gingivitis, was unsuited to receive orthodontic treatment.

OBSERVATIONS

A brief summary of the results is:—

1.6 per cent of the children were found to have congenital absence of one or more teeth and a few cases (0.5 per cent) had clinical evidence of supernumerary teeth but, as full mouth radiography on a large scale was not possible, the complete incidence was not known. Using radiographs Dolder (1936) found that in 10,000 Swiss schoolchildren, the incidence of missing teeth was 3.4 per cent. In addition he found that the incidence of supernumerary teeth was 0.3 per cent, which agrees with Macphée's (1935) findings on the erupted supernumerary teeth in 4000 Glasgow schoolchildren.

11.4 per cent of the children had overcrowded dental arches due, in my opinion, to the teeth being too large for the available basal bone. These were assessed visually and were not measured, so any doubtful cases were not included in this total. 1 per cent of the children had individual teeth which were

Table I.—AGE DISTRIBUTION OF MEDIAN DIASTEMA (TOTAL 277 in 1000)

	6 yr.		7 yr.		8 yr.		9 yr.		10 yr.		11 yr.		12 yr.		13 yr.		14 yr.		15 yr.	
	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
Up to 1.9 mm.	16	15	27	26	25	22	14	19	5	2	5	6	9	9	3	11	10	8	—	2
2.0-2.9 mm.	3	2	10	8	3	4	4	1	—	—	—	—	—	—	1	—	1	0	—	—
3 mm. and over	2	2	—	1	—	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—
Total/year total	40/87		72/147		55/128		38/115		7/70		11/98		19/98		15/128		20/101		2/28	
Percentage	46		48		43		33		10		11		19		12		20		7	

b. Lip (whether held passively or actively in a malposition).

c. Tongue (whether held passively or actively in a malposition).

d. Nail-biting.

5. Assessment of Treatment required.—

a. Its urgency.

b. Whether observation only or active treatment was required; and if so

too large, e.g., upper lateral incisors which were of a similar width to the upper central incisors.

1.1 per cent of the children had deciduous molars in infra-clusion.

6 of the children had lower 1st deciduous molars affected in this way.

2 of the children had lower 2nd deciduous molars affected in this way.

1 of the children had upper 1st deciduous molars affected in this way.

1 of the children had all four 2nd deciduous molars affected in this way.

1 of the children had all four lower deciduous molars affected in this way.

2 per cent had lost between one quarter and one half of the original space;

44 per cent had lost over one half of the original space, but more follow-up observations have to be made on these 190 children along the lines of Pringle (1937, 1938), Schachter

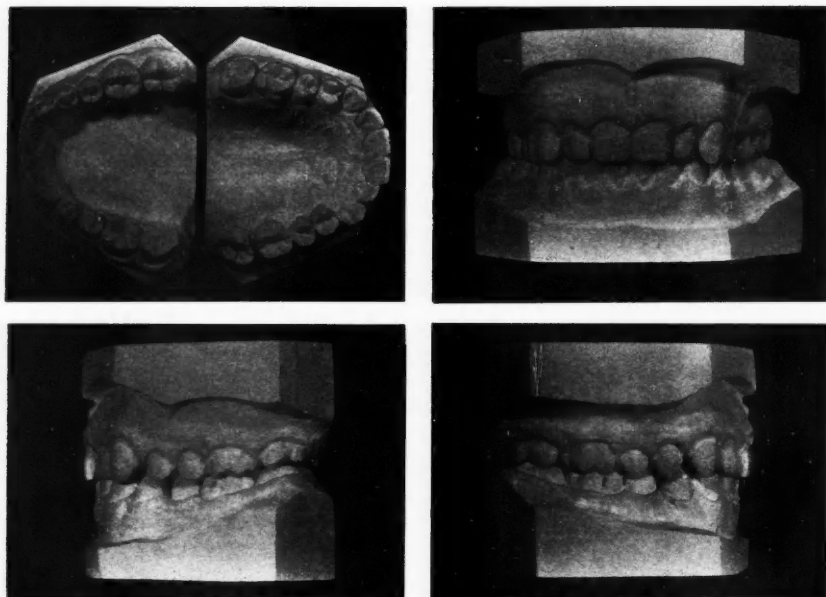


Fig. 3.—An example of one of the best occlusions examined.

A space between the upper central incisors occurred in 27.7 per cent of the cases and the age distribution shows the condition to decrease with age; as shown in *Table I. 229*, or over 80 per cent, of these cases with a median diastema were associated with persistent fræna.

Regarding loss of space in the dental arches due to premature loss of the deciduous molars or loss of tooth width due to caries, in 19 per cent of the children it was possible to measure the space lost by comparing the reduced space on the site of the extraction with the medio-distal width of a sound tooth on the opposite side of the dental arch as shown previously.

The immediate results from these 19 per cent are:—

34 per cent lost up to a quarter of the original space;

(1943), Seipel (1949), and Breakspear (1951) before any useful information can be obtained.

In a further 41 per cent of the children space loss had occurred, but because of the absence of, or severe interproximal caries in, the corresponding tooth on the opposite side of the dental arch, it was not possible to measure the space lost. The remaining 40 per cent of the children had not suffered any space loss due either to their dental arches being intact or to the deciduous molar having been lost only just prior to the examination.

As stated previously, in the present survey "malocclusion" has been taken to mean any departure from normal occlusion which is, in my opinion, severe enough to warrant treatment, and normal occlusion has been accepted as being in a dentition where there is good

arch form and all teeth in good relation to adjacent as well as to opposing teeth. An excellent form of such an occlusion is seen in Fig. 3 and a similar standard of dentition occurred in 2.1 per cent of all the 1000 children examined. Another 23.7 per cent of all the children, though not possessing an excellent occlusion, would develop a good working occlusion without the aid of orthodontic treatment. It is natural that the definition of normal occlusion will vary with each observer, and from a review of other surveys (Korkhaus, 1928; Goldstein and Stanton, 1936; and Telle, 1951) my own definition would appear narrow.

In the present survey, then, 74.2 per cent of the children were considered to have some

i.e., whether the lower arch lay *more than $\frac{1}{2}$ cusp unit medial or distal to the upper arch*, as shown in Fig. 4. The importance of defining these limits of occlusal malrelationship was shown by the fact that *if all the children*

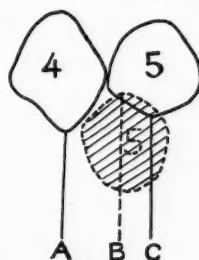
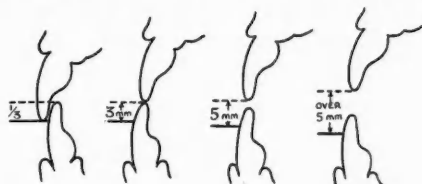
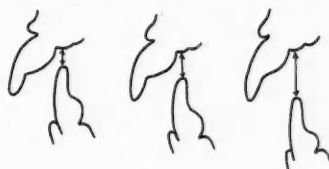


Fig. 4.—Diagram showing the extent of distal and medial occlusion designated as Class II and III.



NORMAL 60% SLIGHT 2% MODERATE 3% EXTREME
UP TO 3mm UP TO 5mm OVER 5mm
OPEN BITE OPEN BITE OPEN BITE

Fig. 5.—Diagram showing the measurement of open bite in those occlusions with little or no overjet.



5% SLIGHT 7% MODERATE 23% EXTREME
UP TO 2mm 2-3mm OVER 3mm
OPEN BITE OPEN BITE OPEN BITE

Fig. 6.—Measurement of open bite where a marked overjet was present.

form of malocclusion and this was considered under three headings:—

1. Anteroposterior malrelations of the dental arches.

having exactly $\frac{1}{2}$ cusp unit distocclusion were included in Class II the result would be 25 per cent instead of the 10.9 per cent shown in Table II.

Table II.—INCIDENCE OF MALOCCLUSION (ANGLE)

Angle Class I	88.5 per cent	
Angle Class II	10.9 per cent	
Angle Class III	0.6 per cent	
Angle Class II		
73 per cent Unilateral	} 37 per cent division (1) 10 per cent division (2) 53 per cent neither	
27 per cent Bilateral		
18 per cent Open bite		
82 per cent Close bite		
Angle Class III		
66 $\frac{2}{3}$ per cent Bilateral		
33 $\frac{1}{3}$ per cent Unilateral		
33 $\frac{1}{3}$ per cent Open bite		
66 $\frac{2}{3}$ per cent Close bite		

2. Vertical malrelations of the dental arches, i.e., open or close bite.

3. Lateral malrelations of the dental arches i.e., cross-bite conditions.

So that they could be compared with other surveys the anteroposterior arch malrelationships were classified under Angle's system,

Considering now the malrelations in a vertical plane, 14.8 per cent of the children had an open bite. This was measured as shown in Fig. 5. Where the incisal edges were in the same vertical plane, the degree of open bite was measured in millimetres from the tip of the upper central incisors down to the point

of normal overbite, which was taken to be one third the crown height of the lower incisors. These cases were divided into three groups (Fig. 5): in the first group were those cases with a diminished overbite up to an

overlapped the lower central incisors. A third of the lower crown height overlap was regarded as normal (Fig. 7).

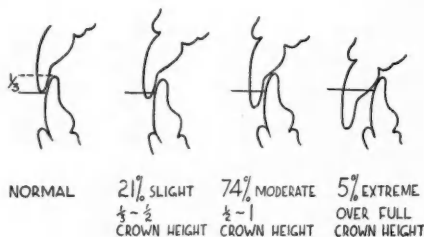


Fig. 7.—Measurement of overbite.

edge-to-edge incisor bite. In the second group were those having an actual vertical space between the incisal edges of up to 2 mm. The third group consisted of those with a vertical space of over 2 mm. In cases of severe overjet, e.g., Angle Class II (1), the



Fig. 8.—Testing a prominent frænum for any attachment to the palatal tissues.

The age distribution of both open bite and overbite is shown in Table III.

Table III.—AGE DISTRIBUTION OF OPEN AND CLOSE BITE
Age Distribution of Open Bite

	6 yr. B. G.	7 yr. B. G.	8 yr. B. G.	9 yr. B. G.	10 yr. B. G.	11 yr. B. G.	12 yr. B. G.	13 yr. B. G.	14 yr. B. G.	15 yr. B. G.
Slight	6 6	11 10	5 8	2 3	2 3	1 6	1 2	5 7	4 10	2 2
Moderate	1 1	1 2	— —	1 2	1 —	— —	1 2	— 1	1 1	— —
Extreme	3 3	4 7	— 4	— 1	1 —	3 1	2 1	2 3	1 1	— —
Total/year total	20/87	35/147	17/128	9/115	7/70	11/98	9/98	18/128	18/101	4/28
Percentage	23	24	13	8	10	11	9	14	18	14

Age Distribution of Close Bite

	6 yr. B. G.	7 yr. B. G.	8 yr. B. G.	9 yr. B. G.	10 yr. B. G.	11 yr. B. G.	12 yr. B. G.	13 yr. B. G.	14 yr. B. G.	15 yr. B. G.
Slight	8 7	8 14	15 6	7 11	6 6	7 8	11 13	10 20	11 15	1 4
Moderate	28 13	35 29	46 36	43 39	27 17	33 34	34 29	29 42	25 24	3 13
Extreme	2 1	5 3	3 —	4 —	2 2	3 —	— —	4 2	5 1	— 1
Total/year total	59/87	94/147	106/115	104/115	60/70	85/98	87/98	107/128	81/101	22/28
Percentage	68.8	63.8	82.8	90	86	86.7	88.7	84.3	81	78.5

lower incisors lay below the palatal tissues (Fig. 6). In these cases the degree of open bite was measured in millimetres from the point of normal overbite to the palatal tissues directly above that point.

Overbite was measured according to the extent that the upper central incisors

Lateral malrelations or posterior cross-bite of the dental arches occurred in 9.5 per cent of the children.

Examination of the soft tissues revealed:—

47.6 per cent of the children had a persistent upper labial frænum. This was tested by stretching (Fig. 8).

27.2 per cent of the children had sucked thumbs or fingers, and of these 64, or 24 per cent, were still actively sucking at the time of the examination, but only a small proportion

spacing (Table VI). In 41 per cent of these cases it was a posture, the lip remaining there passively, but in 59 per cent of these cases it was an active habit. The age distribution of

Table IV.—AGE INCIDENCE OF OPEN MOUTH HABIT

	6 yr. B. G.	7 yr. B. G.	8 yr. B. G.	9 yr. B. G.	10 yr. B. G.	11 yr. B. G.	12 yr. B. G.	13 yr. B. G.	14 yr. B. G.	15 yr. B. G.
Total/year total	18 5 23/87	29 24 53/147	21 10 31/128	19 21 40/115	15 8 23/70	24 9 33/98	19 14 33/98	14 17 31/128	22 10 32/101	2 5 7/28
Percentage	26.4	36	24.2	34.8	32.9	33.7	33.7	24.2	31.7	25

(39 out of 272, or 14 per cent) had succeeded in producing a malocclusion, e.g., unilateral incisor open bite or unilateral overjet or retroclined lower incisors with proclined upper incisors, which could be directly attributed to these habits.

Table V.—A COMPARISON OF THE MALOCCLUSIONS IN CHILDREN WITH AND WITHOUT AN OPEN MOUTH HABIT

	Out of 306 Children with Open Mouth Habit	Out of 306 Children with- out Open Mouth Habit
Crowded upper incisors	88	78
Crowded lower incisors	87	55
Proclined upper incisors	75	37
Proclined lower incisors	52	30
Close bite	224	255
Open bite	71	37
Posterior cross-bite	46	55

30.6 per cent of the children had an open mouth habit (Fig. 9) and this varied as the age increased (Table IV). Of these, 140, or 45 per cent, had difficulty in breathing through their

these lower lip habits shows no great increases or decreases with age.

Examination of the tongue showed:—

0.6 per cent of the children held the tongue passively between the occlusal surfaces of the posterior teeth.

Table VI.—MALOCCLUSIONS ASSOCIATED WITH LOWER LIP HABIT

	No. in 1000	Promi- nence of Upper Incisors	and/or	Spacing of Upper Incisors
Those having lower lip lying passively under upper incisors	27	15		8
Those having active lower lip habit	41	25		18

10.2 per cent thrust the tongue forwards on swallowing in the manner described by Rix (1946). 53 per cent of these had an open anterior bite.

Table VII.—AGE INCIDENCE OF TONGUE HABITS (ANTERIOR ONLY)

	6 yr. B. G.	7 yr. B. G.	8 yr. B. G.	9 yr. B. G.	10 yr. B. G.	11 yr. B. G.	12 yr. B. G.	13 yr. B. G.	14 yr. B. G.	15 yr. B. G.
Total/year total	5 7 12/87	11 16 27/147	4 11 15/128	1 2 3/115	1 2 3/70	4 7 11/98	3 5 8/98	5 10 15/128	2 4 6/101	— 2 2/28
Percentage	14	18	12	3	4	12	8	12	6	7

nose and many had the small nostrils seen in Fig. 9. The common malocclusions in these children with an open mouth habit are shown in Table V.

6.6 per cent of the children held the lower lip under the upper incisors, and many of these cases had prominent upper incisors often with

2.6 per cent thrust the tongue laterally on swallowing.

5.2 per cent of all the children had, in addition to the tongue-thrusting habit, a thumb- or finger-sucking habit. The age incidence of these tongue habits is shown in Table VII.

Nail-biting occurred in 22.9 per cent of the children (Fig. 10) and the age distribution (Table VIII) shows that the habit reduces with age but no malocclusion in the children



Fig. 9.—Open mouth habit.

examined could be attributed to this factor as far as could be ascertained (Table IX).

Also included in this survey were the two subsidiary points of eruption dates and oral hygiene.

The state of oral hygiene in the children varied and they were divided into three groups according to the cleanliness of their mouths. In the first group of 36 per cent were those children with clean mouths. The second group of 48 per cent consisted of those children with a visible mucous film over their teeth. The remaining 16 per cent were in the third group who rarely if at all brushed their teeth, so

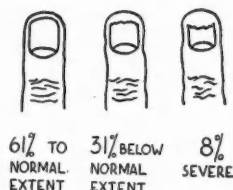


Fig. 10.—Classification of nail-biting.

that food debris was visible in the gingival sulcus in addition to stain and coating on the teeth.

Treatment is a matter of individual opinion and so rather a difficult thing to assess. What one orthodontist would treat another may not. The following estimations err on the side of too much rather than too little treatment, for not only was it assumed that the maximum facilities were available for treatment but also that, unless otherwise clearly indicated, the child and the parents would accept the necessary orthodontic treatment. Therefore this is an

Table VIII.—AGE INCIDENCE OF^a NAIL-BITING

	6 yr.		7 yr.		8 yr.		9 yr.		10 yr.		11 yr.		12 yr.		13 yr.		14 yr.		15 yr.	
	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
Normal extent	1	2	11	9	13	6	7	8	4	7	12	7	13	5	8	9	4	13	—	2
Below normal	4	1	4	3	1	3	2	3	1	3	6	4	5	9	4	6	7	3	—	1
Severe	—	—	—	—	2	2	—	—	—	—	2	2	1	1	1	2	1	2	—	2
Total/year total	8/87		27/147		27/128		20/115		15/70		33/98		34/98		30/128		30/101		5/28	
Percentage	9.2		18.4		21.1		17.4		21.4		33.7		34.6		23.4		29.7		17.8	

Examination of the dentition of these children showed that the eruption dates of some of their teeth varied from those of the 1792 Birmingham children in the survey by Clements, Davies-Thomas, and Pickett (1953) and from the survey of children by Ainsworth (1925) as shown in Table X.

estimate of the treatment *required* rather than the treatment *demand*ed.

3.4 per cent of all the children were found to be unsuitable for treatment owing to lack of availability (leaving school or the district), very poor oral hygiene, or a lack of reasonable interest in the treatment.

2.1 per cent of all the children had excellent occlusions, so would not require any orthodontic treatment.

23.7 per cent of all the children, though not possessing an ideal occlusion, would, in my

midline diastema and a prominent frænum might be considered more fully.

When first examining fræna, it was realized that there were two main types, i.e., those which, when stretched, produced blanching in

Table IX.—MALOCCLUSIONS IN THOSE CHILDREN BITING THEIR NAILS

EXTENT OF NAIL-BITING	No.	LINGUAL OCCLUSION OF INCISORS	EDGE-TO-EDGE BITE OF INCISORS	INCISAL OPEN BITE	CLOSE BITE	CROWDED UPPER INCISORS	PRO-CLINED UPPER INCISORS	RETRO-CLINED UPPER INCISORS	CLASS			DIGIT SUCKING HABITS
									I	II	III	
Trimming to normal extent	141	12	5	12	120	43	28	7	85	49	6	33
Trimming below normal	70	7	3	9	35	20	14	3	49	25	—	26
Severe	18	3	—	1	11	6	4	1	14	4	—	4

opinion, develop a good working occlusion without the aid of orthodontic treatment.

20.4 per cent of all the children were doubtful cases which, though not requiring active

the anterior tissues of the palate (*Fig. 8*) and those which did not produce blanching, the ratio being approximately 4:1. In order to study further the more numerous blanching

Table X.—AGES OF TOOTH ERUPTION

	YEAR	No. OF CHILDREN	1 1	6 6	6 6	1 1	2 2	2 2	4 4	3 3	4 4	5 5	3 3	5 5	7 7	7 7
Sheffield Survey	1953-54	1000	6	6	6	7	7	7½	9	9½	9½	10	11	11½	11½	11½
Clements, Davis-Thomas, and Pickett	1947-48	1792	6	6	6	6½	7	8½	10	10	11	11½	11	12	11½	11½
Ainsworth	1924	4258	6½	6	6	7	7½	8½	10	10½	10½	11	11½	11½	11½	12

treatment at the time of the examination, were recommended to be inspected periodically to ascertain whether their malocclusion was progressing in undesirable directions.

39.8 per cent of all the children were cases requiring uncomplicated treatment, e.g., extractions and/or simple orthodontic appliances such as an oral screen, inclined plane, screw or finger spring plates.

10.6 per cent of all the children were complicated cases involving treatment by an experienced orthodontist with fixed and/or the more advanced myofunctional appliances.

DISCUSSION

In considering these results the question of whether there is some connexion between a

type of frænum, it was decided to divide them into four sizes, as shown in *Fig. 11*.

Table XI.—THE RELATION BETWEEN FRÆNUM AND DIASTEMA

FRÆNUM	DIASTEMA			
	Nil	Under 1.9 mm.	2.0-2.9 mm.	Over 3 mm.
88 Non-blanching	72	12	3	1
153 Small	70	74	8	1
166 Medium	70	81	13	2
58 Large	13	32	9	2
11 Extra large	—	5	3	4

In *Table XI* can be seen the relation between the different types of frænum and the width

in millimetres of the median diastema associated with them. Broadly, the larger the frænum the wider the diastema, but this does not explain whether the frænum causes the diastema or the diastema permits the frænum

these median diastema cases would seem to be a persistent frænum, and most observers (Tait, 1924; Taylor, 1939) are agreed that the incidence of fræna decreases with age (Table XIII).

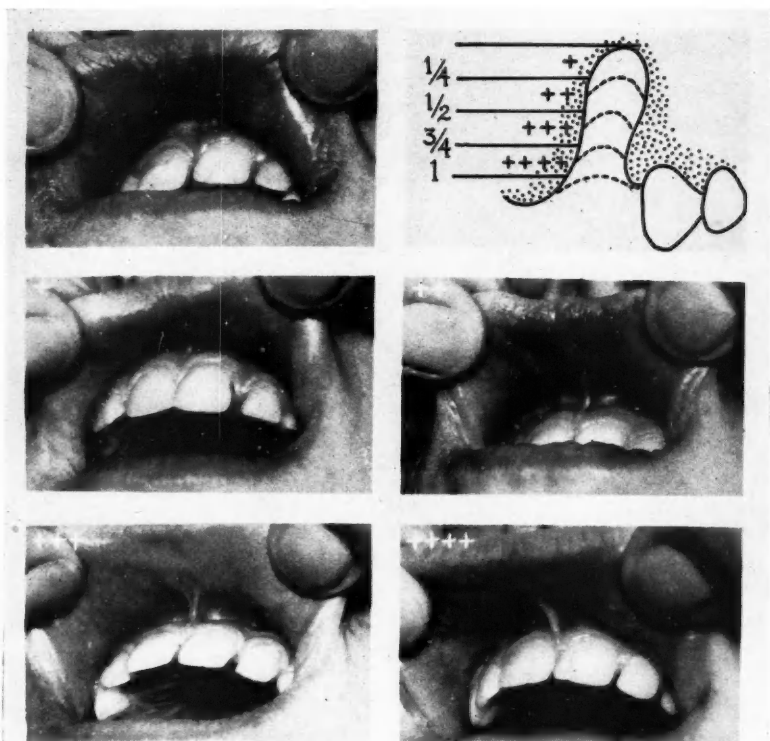


Fig. 11.—Sizes of the fræne that produced, when stretched, blanching of the palatal tissues.

to persist. Tait (1924) states that "the frænum is an effect sometimes associated with, but not the cause of, separated upper central incisors". Taylor (1939) says that "The space may be the result of a number of causes among which are tongue, finger, or lip habit, endocrine dysfunction, missing teeth, short upper lip, anterior dental protraction, peg laterals, large mandibular teeth". Table XII, therefore, shows the correlation between some of these different factors and the width of the diastema. As can be seen, the most constant factor in

The question of open incisor bite is obviously quite extensive. In this survey it was not possible to investigate all the causes, such as heredity, but it was possible to show the different conditions which accompanied such a malocclusion (Table XIV). Seipel (1949) also found that the incidence of open incisor bite decreased with age, and Goldstein and Stanton (1936) attribute this to the reduction in sucking habits. Humphreys and Leighton (1950) in their survey found that almost all cases with an open bite were associated with sucking

habits and the findings of Ruttle, Quigley, Crouch, and Ewan (1953) were similar.

The final question that I wish to consider is the incidence and the effect of the various sucking habits (Table XV). The significant

a malocclusion which could be attributed to it.

2. Only half the children actively sucking fingers or thumbs at the time of examination showed evidence of this on their digits.

Table XII.—CONDITIONS ASSOCIATED WITH A MEDIAN DIASTEMA

	WIDTH OF MEDIAN DIASTEMA		
	Up to 1.9 mm.	2.0 to 2.9 mm.	Over 3.0 mm.
No. having median diastema as shown	233	38	9
No. having crowded upper incisors	18	2	—
No. having spaced upper incisors	94	12	3
No. having prominent upper incisors	46	5	2
No. sucking thumbs or fingers at time of examination	19	1	2
No. having lower lip habit	23	3	1
No. thrusting tongue forwards	26	11	2
No. having open mouth habit	75	13	1
No. having a frænum	202	38	8
No. having absence of $\frac{2}{2}$	3	—	—
No. having small $\frac{2}{2}$	—	—	—

Table XIII.—AGE DISTRIBUTION OF LABIAL FRÆNUM (TOTAL 476 IN 1000)

	6 yr.		7 yr.		8 yr.		9 yr.		10 yr.		11 yr.		12 yr.		13 yr.		14 yr.		15 yr.	
	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.	B.	G.
Non-blanching	9	4	7	12	—	1	3	4	2	—	5	1	5	3	13	4	11	2	1	1
Small +	11	4	15	14	26	9	12	12	3	3	4	5	4	8	4	10	2	7	—	—
Med. ++	12	10	23	23	10	18	8	10	4	5	4	5	7	7	3	7	6	3	—	—
Large +++	9	9	7	8	4	6	3	3	1	—	1	—	—	3	1	1	1	—	—	1
V. Large ++++	3	3	—	1	—	1	1	—	—	—	—	—	—	—	—	1	1	—	—	—
	44	30	52	58	40	35	27	29	10	8	14	11	16	21	21	23	21	12	1	3
Total/year total	74/87		110/147		75/128		56/115		18/70		25/98		37/98		44/128		33/101		4/28	
Percentage	85		75		59		50		26		25		37		34		33		14	

Table XIV.—OPEN INCISOR BITE (148 in 1000) AND ASSOCIATED CONDITIONS

	Open Bite	Close Bite
Open mouth habit	71/306 (23 per cent)	200/306 (65 per cent)
Lower lip habit	9/66 (14 per cent)	55/66 (85 per cent)
Tongue habit (ant.)	68/102 (69 per cent)	27/102 (27 per cent)
Thumb sucking (active)	19/37 (51 per cent)	13/37 (35 per cent)
Finger sucking (active)	8/16 (50 per cent)	5/16 (31 per cent)

points arising from these results would seem to be:—

1. Only 14 per cent of the children who had sucked or were sucking fingers or thumbs had

3. Dummy sucking habits had the advantage of not extending beyond 4 or 5 years of age.

4. Only 3 per cent of the children who had dummies subsequently developed thumb

or finger sucking habits. Humphreys and Leighton (1950) also came to the conclusion that dummies, although producing some malocclusion, are not as harmful as thumb- or finger-sucking.

in planning this survey; from colleagues in the preparation of this paper; from Mr. Cousins, of the United Sheffield Hospitals Department of Medical Photography, in preparing the illustrations; from the University of Sheffield

Table XV. SUCKING HABITS

16 per cent of all the children had a history of sucking thumb or fingers up to 5 years	} Only 39 of these 272 children or 14 per cent with sucking habits showed a malocclusion (i.e., unilateral open incisor bite or unilateral overjet) directly attributable to these habits.
11.2 per cent of all the children had a history of sucking thumb or fingers after 5 years and in 64 of these 112 children the habit was still active at the time of the examination.	
19.5 per cent of all the children had a history of sucking a comforter. Only 7 of these 195 children subsequently developed finger or thumb sucking habits.	
2.4 per cent of all the children had a history of sucking other objects (bedclothes, dolls, etc.).	
20.6 per cent of all the children had an uncertain history of sucking habits (e.g., orphaned and adopted children).	
30.3 per cent of all children had no history of any sucking habit.	
Damage to digits following sucking habit	
1.7 per cent wrinkled palmar surface.	
0.9 per cent hardened skin over knuckle.	
0.3 per cent twisted digit.	

SUMMARY

1. An account is given of an examination by an orthodontist, of 1000 unselected Sheffield schoolchildren, boys and girls, between the ages of 6 and 15 years.

2. The examination was visual, models and radiographs not being used.

3. The incidence of supernumerary teeth, partial anodontia, large teeth, median diastema, and space loss is given.

4. 742 of the children were considered to have a malocclusion and the arch malrelationships of these, classified under Angle's system, were: 88.5 per cent Class I, 10.9 per cent Class II, and 0.6 per cent Class III. The incidence of open and close bite and posterior cross-bite is also given.

5. The incidence of persistent fræna, lip and tongue habits, finger-, thumb-, and dummy-sucking habits, and nail-biting is shown, together with the effect on the occlusion.

6. The extent and nature of the orthodontic treatment considered necessary is also given.

Acknowledgements.—In conclusion, I would like to acknowledge with gratitude the help I have received from the late Miss K. C. Smyth

Research Fund; and from the Principal School Medical Officer of Sheffield and the Head Teachers and Staff of the Hunter's Bar School for information and ready help in the examination of these children.

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DISCUSSION

Miss L. M. Clinch, in opening the discussion, said she preferred not to use the term "normal" in describing an occlusion, as it had several different meanings in this connexion.

She thought it would have been an advantage if models had been taken of the children concerned in Mr. Gardiner's investigation, as she felt that a diagnosis of malocclusion could be accurate only if models were examined after the examination of the child. Moreover, models were useful to other people who might want to work on similar material, and they were also valuable in a follow-up of the same material.

Mr. Gardiner stated in his paper that over 80 per cent of the cases in his investigation which had a median diastema were associated with persistent fræna. She thought that all central incisors were associated with a frænium and that it was anatomically correct for these teeth to erupt spaced. Mr. Gardiner showed that the percentage of the children with a median diastema decreased from 46 per cent at 6 years of age to 7 per cent at 15 years of age, but he gave the figure of 47.6 as the percentage of those children with fræna that persisted. When did a frænium become a persistent frænium?

Mr. Gardiner stated that only 14 per cent of the children with sucking habits showed a malocclusion directly attributable to those habits, and he added: "that is unilateral open incisor bite or unilateral overjet". Did he consider that those were the only malocclusions resulting from a sucking habit? She had found many cases of subnormal maxillary arches resulting in a cross-bite and others with linguoclination of the mandibular incisors which she had attributed to sucking habits.

With regard to Mr. Gardiner's statement that many of the children with thumb- or finger-sucking habits showed no evidence of this on their digits, she knew from personal experience that one reason for this was that the tongue could be used as a cushion between the teeth and the thumb or the finger, and that prevented any hardening or thickening of the skin. It was often possible, however, to diagnose a habit from the cleanliness of one digit as compared with the others.

She was surprised that only 0.6 per cent of the children kept the tongue passively between the posterior teeth. She would have thought that, with the jaws in a resting position, the tongue would automatically bulge into whatever space was available. This tied up with the question of tongue thrust and open bite. Would Mr. Gardiner agree that the open bite might come first and that again the tongue would automatically bulge into the open space, at least during swallowing?

On the question of open bite, she had always considered that in a case of anterior open bite there was a vertical space between the tips of the incisors. If the tips of the incisors met she called it an edge-to-edge bite.

When the lateral and central incisors were the same size she had often found that there was not greater tooth bulk but that the total width of the two teeth was about the normal width of a central and a lateral incisor, so a large lateral did not necessarily mean that there must be crowding of the teeth.

It appeared that nail-biting reached its maximum just about the time of the 11+ examination, which was what she would expect.

She would like to ask Mr. Gardiner if he intended to have a statistical analysis made of his figures as this

would seem to be a useful line of inquiry in a survey of this kind.

Mr. V. G. Pedley said that the findings in an investigation such as that made by Mr. Gardiner depended to a considerable extent on the type of district in which the children lived. He would be interested to know the social class of the children concerned and whether their environment played any part in the types of malocclusion recorded. He himself treated children in two different types of district; in one the children were of the poorer class and in another they were entirely middle class, and he did not think the same statistics would apply in the two cases.

Mr. B. C. Leighton asked how Mr. Gardiner decided whether the tongue was held actively or passively in malocclusion. This seemed to him to be a rather difficult thing to do.

In the 1.6 per cent of children who apparently had missing teeth, was the deciduous dentition as well as the permanent dentition included and were the third molars included?

It seemed to him that the two methods which Mr. Gardiner used for measuring an open bite were not strictly comparable, because one measurement started from the tip of the upper incisor and the other started from the soft tissues of the palate.

He was surprised at the large percentage of Class II cases (53 per cent) which Mr. Gardiner found could not be put into either division (1) or division (2). He himself had seen such cases, but he had not known that there were so many of them.

He agreed with Miss Clinch's remarks about sucking habits. He had the impression that a cross-bite was a much more common sequel to sucking habits than it would appear to be from what Mr. Gardiner had said. Had he any figures of the incidence of cross-bite among the children who sucked their thumbs?

With regard to the children who thrust their tongues forward when they swallowed, did all of them have their teeth apart at the time of swallowing or did some of them place their teeth into occlusion and thrust the tongue through an existing space between the upper and lower incisors?

The most significant point that he had noticed in the paper was that only 2 per cent of the cases in which space had been lost following early extractions had lost between one-quarter and one-half of the space, all the others having lost either less than one-quarter or more than one-half of the space. It would appear that the children either lost space rapidly and rather completely or did not lose space at all. Perhaps at some time in the future Mr. Gardiner would be able to give some indication of how many of the 34 per cent in the first group, who had lost less than one-quarter of the space, would not need to have the space maintained.

Mr. G. B. Hopkin said that in his experience there was a familial factor present in most cases of true median diastema.

With regard to the degree of distal occlusion, he was carrying out a survey of a rather more limited scope than Mr. Gardiner's, but he had so far been impressed by the relatively large number of cusp-to-cusp cases in Angle's Class II. In the figures which he had up to date they comprised about one-third of the cases which he would classify as Angle's Class II.

Dr. J. H. Scott asked whether Mr. Gardiner thought that 1000 was an adequate number. It seemed a large number, but when it was distributed from 6 to 15 years of

age there was a very small number in each age group. That might explain the irregular results which Mr. Gardiner had obtained for some malocclusions. He thought it would be a great advantage if the number was increased to 5000.

He would like to know why Mr. Gardiner objected to the use of the term "edge-to-edge bite."

Had Mr. Gardiner come to any definite conclusion on the question whether there was any relation between the open-mouth habit and malocclusions?

It was possible that habits were less common in rural children than in urban children. It might be that the stress of modern living which was experienced especially in towns caused an increased tendency to habits of all kinds. He thought it would be worth while to carry out a parallel investigation on an equal number of children in a rural area.

He thought it was a pity that Mr. Gardiner had not carried out any investigations amongst the parents, brothers, and sisters of the children concerned. Even if he could get details only of the mothers it would be interesting.

Mr. J. C. Ritchie said he thought there would be a diastema between the central incisors if there was a powerful fibrous band passing between the two central teeth. He did not think that the removal of a triangular area of the frænum would do any good at all in the matter of reducing the diastema. He thought that the whole fibrous band had to be removed and dissected out right back to the incisive papilla. If that was done at the time of the eruption of the lateral teeth, the two central incisors would move together.

With regard to the hereditary factor, he had under his care at the moment four children who originally had a diastema. Their father had a very wide diastema. In three of the children a frænectomy had already been done and the diastema had closed by the age of nine years. It was now five years since the first one had been done and there was no sign of any recurrence.

At the moment he was carrying out a small investigation to discover why cross-bite occurred, and he thought that his conclusions would be reached fairly soon. He was certain that cross-bite had nothing at all to do with a sucking habit. He thought it was due to a lack of width in the upper temporary canine region at the time when these teeth were erupting. A small child was faced with an edge-to-edge bite, a two-point contact only, and for comfort and occlusion the child had to bring the mandible either forward or to one side or the other. He had under his care at the moment twenty children, between two and five years of age in whom cross-bite had been caused by an edge-to-edge bite.

Mr. H. E. Wilson, referring to the question of lost space following extractions, said it would be of some value if the loss of space was correlated with the time of the extractions and the age at which the investigation was carried out.

Mr. Gardiner mentioned nail-biting under habits, but it was more easily acquired and discontinued than other habits and was less harmful. When questioned, a child often admitted starting it because some school friend or near relation did it—a history more common with nail-biting than sucking habits.

Mr. A. F. D. Shapland, referring to the question of loss of space, said Mr. Gardiner had stated that 190 children were examined for loss of space and 80 per cent had shown some loss, and then he had said that 40 per cent showed no loss of space. Which was the correct figure?

200

Mr. G. C. Dickson asked whether Mr. Gardiner had taken any advice on the statistical significance of his figures. He thought it would be an advantage if they were subjected to statistical analysis.

Miss R. Casley said she thought the diastema should be related to the stage of full eruption of the canines rather than to the age of the child, as the diastema often closed naturally at that stage.

The President asked whether Mr. Gardiner had taken extractions into account in his figures of median diastema.

Mr. J. H. Gardiner, in replying to the discussion, said he agreed with Miss Clinch that it was difficult to define "normal." He also agreed with her remarks about models. He thought that in future investigations models might well be taken, but in the investigation in question he had wanted to find a certain amount of information from observing a large number of ordinary children and he had not taken models. He agreed that they would have made the investigation much more valuable.

With regard to the question of when a frænum was persistent and when it was not, he had decided that purely by size. He had not included in the survey any frænum which was below one-quarter the distance from the highest point of reflection of the mucous fold down to the lowest point of the incisive papilla. The figures given were those of all fræna which were larger than that.

Miss Clinch's point about cross-bite and sucking habits was interesting, and he would look at his figures again from that point of view.

He had taken into consideration the question of cleanliness in assessing thumb-sucking. It had been more obvious in the boys than in the girls.

On the question of the tongue lying between the occlusal surfaces of the posterior teeth, he had taken the more extreme cases in which the tongue lay right over the occlusal surfaces and there were some markings on the lateral surfaces of the tongue.

He could not express any opinion yet on the question whether the tongue thrust or the open bite came first.

With regard to the assessment of open bite, he had sought to take it from some fixed point to include all those cases of deficient overlap of the incisors which otherwise could not be taken any account of at all.

In reply to Mr. Pedley, 6 per cent of the families were professional families (ministers, architects, school teachers, and so on), 9 per cent were the labouring class, and the rest were artisans, such as fitters, engineers, and so on. The majority lived in terrace houses.

With regard to Mr. Leighton's remarks, the missing teeth did not include third molars. It had not been possible to X ray all the children, so the figures were not as conclusive as the figures given by Dolder, who had employed a mass radiographic technique.

In connexion with tongue thrust the question of teeth-apart swallow had been investigated, and those with an open bite had been noted.

In reply to Mr. Hopkin, no parents had been investigated in the survey to see whether the median diastema was hereditary, but he had noticed, in the case of children attending hospital, that in some cases it was a condition inherited from one or both parents.

With regard to Angle's Class II cases, Angle had probably based all his figures on cases occurring in his own practice, so that they would all be fairly confirmed cases of malocclusion, whereas the figures in the survey in question and in some of the other surveys were taken from ordinary children, whether they had malocclusion or not, so they would probably be very much lower.

For instance, he had found that there was a considerable discrepancy between his figures taken in the orthodontic survey and those from children who attended the clinic because they had malocclusion.

He agreed with Dr. Scott that 1000 children was not an adequate number in the case of some of the figures, and that applied especially to the older groups.

Units had been used in the assessing of Class II. He had used all units—canines, molars, and premolars.

The edge-to-edge bite had been noted, but he had not brought it into the results of the survey on the present occasion.

The point as to what malocclusions, if any, could be associated with the open-mouth habit was an interesting one.

The question of the percentage of malocclusion in town children as compared with country children would be well worth investigating.

He intended to investigate the correlation of loss of space with time of extraction and age at investigation.

It had been found that the information given by the children about the sucking habits of their class mates had to be checked with the schoolmistress.

He had not sought statistical advice yet, because he had not reached the end of the survey. He realized that it would produce a number of changes.

Miss Caseley's point about relating the diastema to the eruption stage of the canines was another point which could be followed up.

With regard to the President's question about extractions, there had not been enough finance available to make it possible to investigate the dental history of all the children and obtain exact information on that point, but it was an important point in median diastema cases. Obviously if a child had lost two upper first premolars one could expect more spacing of the anterior teeth.

On the motion of the President, a vote of thanks was accorded to Mr. Gardiner, and the meeting then terminated.

SOCIETY NOTES

THE INSTITUTE OF BRITISH SURGICAL TECHNICIANS (INC.)

The following lectures will be given under the auspices of the Dental Section of the Institute of British Surgical Technicians:—

"Construction of Fixed Bridge Dummies and their Relation to Hygiene," by Mr. R. R. Waldsax, D.M.D. (University of Bonn), on Tuesday, Feb. 21, 1956, at the Eastman Dental Hospital, Gray's Inn Road, London, W.C.1, at 6.30 p.m. Tickets are obtainable on application to the Institute, with stamped addressed envelope.

"Partial Denture Design and Problems," by Mr. R. Earnshaw, M.D.Sc. (Lecturer in Prosthetics at the Turner Dental School), on Friday, Feb. 24, 1956, at 7.30 p.m., in the Turner Dental School, Bridgeford Street, Manchester 15. Tickets are obtainable on application with stamped addressed envelope to Mr. A. Litherland, L.I.B.S.T., 32 Whitebrook Road, Fallowfield, Manchester.

XXXI CONGRESSO ITALIANO DI STOMATOLOGIA

The XXXI Italian Congress of Stomatology, promoted by the "Associazione Medici Dentisti Italiani" (Italian Society of Stomatology) will take place in Florence from Sept. 24–29, 1956.

The following subjects will be reported:—

1. Up-to-date views on oral liquids. Reporter: Prof. R. Bandettini.

2. Precocious diagnosis and therapy in dental and facial orthopædics (Subject of the Social Dentistry). Reporter: Prof. A. Maggioni.

3. Materials and techniques for taking impressions. Reporter: Prof. G. Pejrone.

DUNDEE DENTAL SCHOOL

A symposium on "The Fixed Bridge" is to be held in the Dundee Dental School on the occasion of the visit of Professor Hildebrand, of Stockholm, on April 5–6, 1956. Professor Hildebrand, Dr. Livingstone Ward (London Hospital), Dr. Morrant (Eastman), and Mr. Fairley (Dundee) will be the major contributors. Registration fee one guinea. Accommodation may be obtained in the University Residence at a moderate charge. Further particulars can be obtained from and applications sent to the Adviser of Dental Studies, Dental School, Dundee.

NATIONAL HEALTH SERVICE

General Dental Services

List of Prescribed Drugs

The list of drugs which may be prescribed by practitioners providing general dental services has been revised, and is set out in the National Health Service (General Dental Services) Amendment (No. 2) Regulations 1955.

METASTATIC OSTEOMYELITIS INVOLVING THE MAXILLA AND MANDIBLE

By IAN H. HESLOP, M.B., B.S., B.D.S., F.D.S. R.C.S. (Eng.),
and N. L. ROWE, F.D.S. R.C.S. (Eng.), L.R.C.P., M.R.C.S., L.M.S.S.A., H.D.D. R.C.S. (Edin.)
The Plastic and Oral Surgery Centre, Rooksdown House, Basingstoke, Hampshire

OSTEOMYELITIS is primarily an inflammatory condition of the endosteal soft-tissue elements of bone, secondarily involving the calcified fraction, and caused most commonly by pyogenic organisms.

In osteomyelitis of the jaws infection may reach the bone as a result of:—

1. Local trauma of the overlying mucosa of the alveolar ridges.
2. Local injury to the bone.

cases in which the infection in the bone and the antecedent or associated infection are proved bacteriologically to be due to the same organism.

Acute hæmatogenous osteomyelitis has been the subject of a number of articles in the literature, notably that of White and Dennison (1952) in which 5 mandibular and 4 maxillary cases were noted out of a total of 212 patients affected by the disease. Self (1948) reported

Table I.—CASES OF METASTATIC OSTEOMYELITIS IN WHICH THE JAWS WERE A PRIMARY OR SECONDARY SITE REPORTED SINCE 1928

Author	Cases	Age	Primary Site	Secondary Site
Beekman (1928)	1	—	Tibia and fibula	Mandible
Lyons (1933)	2	14	Right femur	Right ramus of mandible
		14	Right leg	Right mandible
Thoma (1936)	1	6	Right leg	Left ramus of mandible
Heslop and Rowe (1956)	2	2½	Right maxilla	Left radius
		4½	Left humerus	Left mandible

3. Extension of infection from adjacent teeth or soft tissues.

4. Hæmatogenous spread of infection from distant sources.

It is with the last of these causes that we are concerned here.

The term "hæmatogenous osteomyelitis" implies that bacterial infection has reached the bone through the blood-stream and could reasonably include all cases other than those in which there is a direct physical connexion between the bone and the skin surface or a body cavity, or in which there is an obvious local soft-tissue infection spreading later to the bone. In practice, the use of the term is generally confined to those cases in which a definite antecedent infection has been found in the body at some distance from the location of the osteomyelitis. Some authorities carry this contention one stage further and confine the use of the term to those

3 mandibular and 3 maxillary cases of osteomyelitis in a series of 138 patients, and James (1953) has reviewed 40 examples of osteomyelitis and found that the four which occurred in the jaws were all located in the maxilla.

Metastatic osteomyelitis may be regarded as a special variety of hæmatogenous osteomyelitis. The distinctive feature in such cases is that the antecedent infection in the body, which subsequently gives rise to metastatic osteomyelitis, has already become an established osteomyelitis in another bone, the infection being transferred from one site to the other by the blood-stream, probably as an infected thrombus or a clump of bacteria. Metastatic osteomyelitis in which the jaws form the primary or secondary site is exceedingly rare. There have been only 6 reported cases since 1928 involving children up to the age of 15 years (Table I).

CASE REPORTS

Case 1.—Twelve days after birth the patient developed swelling and inflammation around the right eye, and there was purulent discharge from the palpebral fissure. Seven days later there was marked swelling of the right cheek and tenderness inside the mouth, and a further forty-eight hours saw the development of a definite abscess of the right side of the face. This abscess bulged into the nasal cavity and discharged into the mouth.

A diagnosis was made of osteomyelitis of the right maxilla.

Two days after the swelling of the right eyelid commenced, the left wrist swelled and an abscess later developed. This was incised and drained after four days,



Fig. 1.—Case 1. Radiograph of the left wrist showing typical appearances of chronic osteomyelitis. Note simultaneous destruction of original bone and periosteal formation of new bone.

and a course of systemic penicillin was started. Ten days after this the wrist became more swollen, red, and fluctuant, and under general anaesthesia a subcutaneous abscess and a radial subperiosteal abscess were opened. The wound closed, but later broke down and was packed. A radiograph three weeks after the first swelling of the wrist confirmed the clinical diagnosis of osteomyelitis of the left radius (*Fig. 1*).

INVESTIGATIONS.—Hæmoglobin, 80 g. per cent; W.B.C. 19,000 per c.mm. Bacteriological swab from the wrist showed a growth of *Staph. aureus* sensitive to penicillin.

PROGRESS.—The patient had several more operations for sequestrectomy of the wrist, which eventually healed with slight deformity in the form of shortening, and two depressed scars (*Fig. 2*).

It was not until two and a half years after the start of the original illness that the patient was referred to Rookdown House for investigation and treatment of chronic maxillary osteomyelitis.



Fig. 2.—Case 1. Post-operative appearance of wrist showing depressed scars.



Fig. 3.—Case 1. Chronic osteomyelitis of the right maxilla. Appearance two and a half years after the commencement of the disease.

CONDITION ON ADMISSION.—The general condition of the boy was good and he looked well, though a little pale.

Extra-orally there was some swelling of the right cheek, but no sign of inflammation or of any other abnormality (Fig. 3).

Intra-orally there was marked hypoplasia of the edebal, and in the buccal sulcus adjacent to these teeth two sequestra presented which were loose and ready for removal (Fig. 4).



Fig. 4.—Case 1. Intra-oral view showing sequestra.

The patient was discharged from hospital after five days.

PROGRESS.—Six months later there appeared to be complete healing of the mouth. A short while before he was seen on this occasion the patient had sneezed out two small pieces of bone, but examination of the nose showed complete healing in this region.



Fig. 5.—Case 1. Sequestra removed at operation.

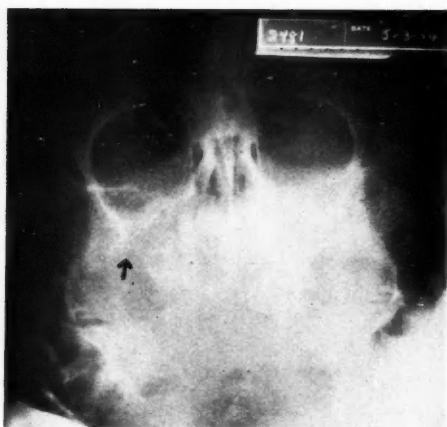


Fig. 6.—Case 1. Occipitontal radiograph six months after sequestrectomy. The arrow indicates the area of bone loss.

INVESTIGATIONS.—Hæmoglobin 12.88 g. per cent; R.B.C. 4,500,000 per c.mm.; W.B.C. 16,000 per c.mm.

TREATMENT.—A course of systemic soluble penicillin at the rate of 500,000 units b.d. was started with the premedication, and the sequestra were removed under general anaesthesia (Fig. 5). Post-operatively aureomycin, 125 mg. six-hourly, was given for 48 hours.

X-ray examination showed notching of the root of the right zygomatic bone, but little evidence of other deformity (Fig. 6).

Case 2.—This patient was a girl $4\frac{1}{2}$ years of age, who fell from a tricycle and injured the left shoulder. She was later admitted to hospital with osteomyelitis of the left humerus. There followed a series of operations on the arm for drainage of pus and sequestrectomy, and during one of the periods in hospital she developed painful swelling of the left side of the face and trismus. This subsided, but as in the case of the arm, there were numerous occasions on which pain and swelling returned.

At the age of 14 years an abscess was drained at the angle of the jaw on the left side, and sequestra separated into the mouth at intervals following this.

When she was 18 years of age an extensive mandibular sequestrectomy was performed from an external approach. Two years later there were further operations on the jaw from an intra-oral approach, and the following year there was another operation on the arm.

During the three months prior to admission to Rook-down House, eight or nine pieces of bone were removed from the mouth.

Three courses of penicillin and one of streptomycin had been administered in the course of the disease up to this time. No details of dosage were available.

CONDITION ON ADMISSION.—When admitted to Rook-down House the patient was 23 years of age and showed evidence of arrest of development of the left half of the mandible, displacement of the mandibular midline to the left, and associated disturbances of the occlusion

(Fig. 7). There was no intra-oral or extra-oral discharge or sinus, and no evidence of active osteomyelitis at either site.

The left humerus showed $1\frac{1}{2}$ in. of shortening, and there was extensive scarring over the upper anterior aspect of the left arm (Fig. 8), with smaller scars over the medial epicondyle and the triceps tendon.

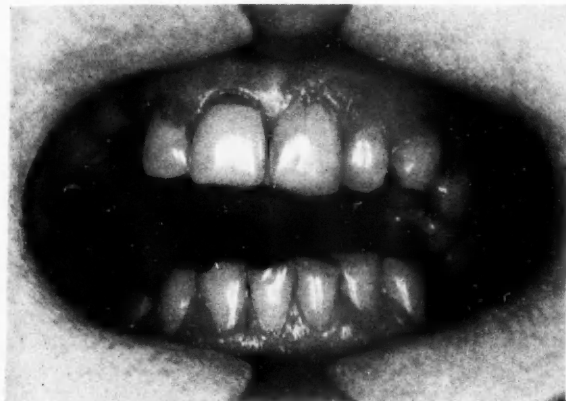


Fig. 7.—Case 2. Intra-oral view showing deviation of the mandibular midline to the left and tilting of the transverse occlusal plane.

The patient was admitted for investigation of pain in the left side of the face and for scar excision. Subsequent investigation showed that the pain was due to chronic sialiectasis, and the symptoms were completely relieved following partial parotidectomy by Mr. P. W. Clarkson, F.R.C.S.

DISCUSSION

Case 1.—Harlowe (1941) stresses that osteomyelitis of the maxilla is a disease of infancy and early childhood rarely to be found in older children and adults, and this case supports this view. McCash and Rowe (1953) reviewed the literature on the condition as seen in infancy, and amongst the points they emphasized was the need to bear in mind the possibility of maxillary osteomyelitis as the correct diagnosis, in cases such as this, where the first presenting appearance is one of a simple orbital cellulitis or of dacryocystitis. They also stressed the need for early and adequate use of aureomycin in preference to penicillin to combat the infection before extensive bone destruction has occurred. Their investigations showed that, at the present time, the majority of the strains of *staphylococcus aureus* re-

sponsible for the disease are totally insensitive to penicillin.

The origin of the initial infection is of interest in cases such as this and James (1953), in his article on acute osteomyelitis in infancy and



Fig. 8.—Case 2. Condition on admission, showing depressed scar of the left arm resulting from osteomyelitis of the humerus at the age of $4\frac{1}{2}$ years.

early childhood, cites a wide variety of sources such as septic digits, otitis media, umbilical abscess, and impetigo, to quote but a few. In the newborn and during early infancy, local trauma to the mucosa overlying the jaws is an important aetiological factor in maxillary osteomyelitis. The abrasion need not be severe, and careless swabbing of the mouth with dry gauze, damage to the mucosa with the finger-nail, or careless use of a mucus catheter during the immediate neonatal period can be sufficient to allow the entry of organisms, which may be derived from any of these sources or from the mother's nipples, the feeding bottle, or the birth canal.

Metastatic osteomyelitis with the jaws as a primary site does not appear to have been previously recorded, and this case is of special interest for this reason.

It is too early to know what will be the final deformity of the facial skeleton, but there is every reason to suppose that it will be slight. There may be some hypoplasia of the permanent dentition in the area previously affected

by the disease, but this will be slight in view of the early stage of calcification of the teeth at the time.

Case 2.—The disease of the humerus in this case is an example of hæmatogenous osteomyelitis. The injury to the shoulder was not one in which local direct infection of the bone was produced, but rather a bruising of the soft tissue and the underlying bone. Speed (1922) states that 90 per cent of acute hæmatogenous osteomyelitis occurs under the age of 15 years, and this figure compares closely with the experience of others. The predominance of the under-15-year-old child amongst the victims of this disease is explained by the frequent exposure of young bones to trauma, and the higher incidence in boys lends support to this view. It does seem necessary, however, for bacteræmia and trauma to coincide if trauma is to be of significance. The source of the bacteræmia must often go undetected, but Green (1935) found that 55 per cent of cases of acute hæmatogenous osteomyelitis had a definite history of antecedent infection, of which approximately half could be traced to respiratory infection.

The patient started her illness at a time when neither chemotherapy nor antibiotics were available, and without doubt the penicillin and streptomycin which she later received helped in the cure of the disease, which otherwise might still have been active and would have caused much greater disablement. It also seems certain that, if suitable antibiotics had been available early in the course of the disease, there would not have been the series of acute exacerbations of the humeral infection, one of which gave rise to metastatic spread of the disease to the mandible.

It is of interest to note that the persistent pain in this patient was cured by partial parotidectomy, and it is probable that the sialiectasis was induced by fibrosis resulting from recurrent episodes of infection of the ramus of the mandible.

SUMMARY

The aetiology of acute hæmatogenous osteomyelitis and its special type, metastatic osteomyelitis, is briefly outlined.

The literature of cases of metastatic osteomyelitis involving the mandible or maxilla as primary or secondary sites is reviewed.

Two cases of metastatic osteomyelitis are reported, one starting in the maxilla and metastasizing to the radius, and the other starting in the humerus and spreading to the mandible.

Acknowledgements.—Case 1 was kindly referred for treatment of the oral condition by Mr. H. Korvin, F.R.C.S., Consultant Orthopaedic Surgeon to Rookdown House.

Case 2 was admitted under the care of Mr. P. Clarkson, M.B.E., F.R.C.S., to whom we are grateful for permission to include it in this report.

The photographs were taken in the Department of Medical Photography, Rookdown House, by Mr. E. Ferrill and Mr. R. Burn, whose kind assistance is appreciated.

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SALON DES MEDECINS ET DENTISTES

The 28th Art Exhibition for Doctors, Dentists, Pharmacists, and Veterinary Surgeons will be held between March 4–25, 1956, at the Musée d'Art Moderne, Paris. The Minister of Public Health will again award medals for the finest paintings, sculptures, photography, decorative and applied art. A very cordial welcome is extended to all British members of the dental profession who should send full details, name, address, qualifications, and titles of works to Dr. Malet, 67 Avenue Pierre-Larousse, Malokoff (Seine), France, without delay. Similar information should appear on exhibits which should be despatched to Messrs. Davis Turner Ltd., 47 Graham Terrace, London, S.W.1, and *not* direct to Paris.

BOOK REVIEWS

FRACTURES OF THE FACIAL SKELETON.

By N. L. ROWE, F.D.S., L.R.C.P., M.R.C.S., L.M.S.S.A., H.D.D., Consultant in Oral Surgery, Plastic and Maxillo-facial Surgery Unit, Rookdown House, Basingstoke, Hants; and H. C. KILLEY, F.D.S., L.R.C.P., M.R.C.S., L.M.S.S.A., H.D.D., Consultant in Oral Surgery, Plastic and Maxillo-facial Surgery Unit, Rookdown House, Basingstoke, Hants; and Contributors. 10 x 7 in. Pp. 923, with 1245 illustrations, 14 in colour. 1955. London: E. & S. Livingstone. 120s.

This is a very comprehensive exposition of a subject, so far partly covered, under the well-known heading of maxillo-facial injuries. The book will not only be of interest to the dental specialist, but also to those with whom he has to collaborate, namely, the plastic surgeon, the neuro-surgeon, the ophthalmic surgeon, the orthopaedic surgeon, the ear, nose, and throat surgeon, and the anaesthetist. The authors and their associates should be highly praised on the elucidation of treatment, etc., of a subject on which only they could authoritatively venture to pronounce definite views. Whether one could agree with everything that is said is open to discussion. However, the book can be classified as an excellent text-book to which every student will turn when confronted with a problem associated with this branch of orthopaedic surgery.

The book is divided into three parts. The first part deals with injuries of the mandible, the second part with the injuries of the middle third of the face, and the third part with the miscellaneous subjects connected with these injuries. One is immediately impressed by the simplicity of the text, fully illustrated by clear photographs, diagrams, and tables. If the following can be called criticisms, they are so insignificant that they do not detract from the value of the book, namely that the size of the book could be reduced, certain trade names could be omitted, some of the bold type lettering could be left out, and some of the chapters could be re-positioned under various parts.

The authors and the publishers are to be congratulated for producing a book of such a very high standard and which will be invaluable in filling the gap amongst the books dealing with this specialty. In its 923 pages, accompanied by 1245 illustrations, 14 of which are in colour, the student will find enough material to satisfy him with the instruction and the enlightenment of the subject in which he is engaged.

H. M.

BONE AND BONES. Fundamentals of Bone Biology.

By JOSEPH P. WEINMANN, M.D., College of Dentistry, University of Illinois; and HARRY SICHER, M.D., D.Sc., School of Dentistry, Loyola University, Chicago. Second edition. 9 $\frac{3}{4}$ x 6 $\frac{3}{4}$ in. Pp. 508, with 302 illustrations. 1955. London: Henry Kimpton. £5.

THE second edition of this book follows the plan of the first edition. Sections on the development of the otic capsule, osteoid osteomas, cementomas, fibrous dysplasia, the Gray lethal mouse, and the 'incisor absent' rat, progressive diaphysial dysplasia, osteopoikilosis, and generalized osteochondrodystrophy have been added.

The subject-matter has been carefully brought up to date. Halisteresis and similar ideas lacking experimental support are again condemned. The previous account of bone calcification, which no longer explains adequately known facts, has been replaced by a theory much more satisfying.

Throughout the book concise explanations are given of each subject considered, the whole presenting a unified and often provocatively stimulating account of bone biology.

All the many histological illustrations are of a very high standard and it seems a pity that two or three of the clinical photographs and radiograph reproductions are of poor quality. These appear to be blocks used in original articles by the authors, from whom they have been borrowed. Possibly fresh blocks could be made for future editions.

The reproduction of some of the clinical radiographs as positives is also irritating.

Bone is an important tissue to dental surgeons and the most 'practically' minded dental practitioner will find this book a valuable and enjoyable addition to his winter reading.

Dental postgraduate students welcomed the first edition of this book and considered it an essential part of their reading. There will be no need therefore to make a special effort to recommend the second edition to them.

For undergraduates this book covers too wide a field, but they would be advised to read selected chapters, especially those on normal histology and development.

While only the views shared by the Authors are, for the most part, presented in the body of the book, those who wish to read further will find a bibliography of 41 pages at the back. This dwarfs the index of only 6 pages, but the orderly arrangement of the subject-matter makes this adequate. G. R. S.

PARLIAMENTARY NEWS

House of Commons

DENTISTS BILL

ON the report stage of the Dentists Bill, Mr. John Hynd (Lab., Attercliffe) proposed in an amendment that if the Privy Council were dissatisfied with the manner in which the General Dental Council were carrying out the provisions governing registration of dentists in Commonwealth and foreign lists, the Privy Council might give directions as to the manner of carrying them out. The purpose, he said, was to ensure that all the assurances given by the Minister in regard to the registration of foreign dentists should in fact be carried out in the spirit of those undertakings.

Seconding the amendment, Mr. Frank Beswick (Lab., Uxbridge) said: "What we are really asking to be assured about is that the decision whether or not these people should be permitted to register should not be decided solely on the basis of one examination or test. We want all the appropriate circumstances to be taken into consideration."

Mr. S. S. Awbery (Lab., Bristol Central) asked for an assurance from the Minister that if a person held a German diploma equivalent to a British diploma then he should have an opportunity to practise.

Capt. J. Baird (Lab., Wolverhampton N.E.) said personally he had sympathy with views expressed. Many of the refugee dentists in the past had had a very hard deal, but one had to recognize that the Bill went a long way to meet the difficulties of these dentists. Somebody had to judge whether a foreign dentist was competent.

He thought the words of the amendment were a slur. It was as if one did not expect the profession to carry out the job properly.

Miss Patricia Hornsby-Smith (Parliamentary Secretary, Ministry of Health) agreed with him. There was in the amendment an implied criticism of the integrity of the General Dental Council, or a suggestion there would be bias.

It would be a grave reflection at the start of the new council if there was a suggestion that they were not qualified to judge in their own profession as other great professions in this country were empowered to do. "It would be a very grave reflection on the members of the General Dental Council which I am quite sure they would resent."

Miss Hornsby-Smith assured the House that the Government believed the members of the General Dental

Council had a sincere desire, accentuated by the acute shortage of dentists, to enrol any dentists who could satisfy them they were capable of a skill worthy of the standard required in the dental service in this country. She did not think it was fair to ask them to go beyond that.

"I believe that to accept this resolution would be an affront to the whole established autonomy of the Council." She was sure the Council would treat applications sympathetically and that facilities would be provided for the three months' practical training or refresher course if required.

Mr. W. Coldrick (Lab., Bristol N.E.) said he supported the amendment because he believed it was wrong for the House to select a small body of professional people and grant them special privileges and powers which they were not prepared to grant to others as far as this country was concerned.

"I am amazed at the Minister coming here and speaking so eloquently on behalf of a small professional body while at the same time she, presumably with a large number of people on the opposite Benches, will fulminate against a number of bumsarees trying to exercise far more limited powers than those now being sought as far as this Dental Council is concerned. I am opposed bitterly to this form of snobbishness which will confer upon professional people powers to determine certain things which they are not prepared to give to other people as far as the community is concerned."

The amendment was negatived.

Miss Hornsby-Smith moved amendments, which were approved, giving effect to the Minister's undertaking in committee to increase the number of elected representatives to the General Dental Council from nine to eleven and to provide that the two extra members should be elected by dentists whose addresses in the register were in England, the Isle of Man, and the Channel Islands, thus increasing the total number to be so selected from five to seven.

Miss Hornsby-Smith moved a Government amendment to increase the minimum number of elected dentists on the Disciplinary Committee from three to four.

The amendment was agreed to.

The House approved a Government amendment stating that the quorum for a meeting of the Disciplinary Committee should be five, of whom at least one should be an elected member of the Council.

The report stage was concluded and the Bill was read a third time. (*Th.*, Jan. 26.)

ABSTRACTS FROM OTHER JOURNALS

The Role of Upper Second Molar Extraction in Orthodontic Treatment

This article deals particularly with the general principles governing the extraction of maxillary second molars. The removal of any teeth requires a fundamental consideration—that restoration of normal maxillomandibular tooth relationship must be done primarily by adjusting the maxillary arch to the mandibular arch in Class II cases. This means a distal movement of the denture *en masse*, or of parts of the denture, with normal overbite and overjet the goal. A case is reported from pretreatment to almost five years out of retention. Appliance therapy was directed solely against the maxilla with extra-oral force. The case is analysed with before and after cephalometric headplates. The two criteria of first importance when considering the sacrifice of maxillary second molars are: first, excessive labial axial inclination of the maxillary incisors, with no spacing present; second, a neutral or even negative overbite. One should beware of those cases where the basal difference is severe, overbite and overjet are marked, and upper incisors are erect, with no spacing.—GRABER, T. M. (1955), *Amer. J. Orthodont.*, 41, 354.

The Prosthetic Management of Oral and Facial Defects following Cancer Surgery

The simpler defects of the maxilla and mandible following surgery should be dealt with as early as possible. Small defects of the maxilla can be covered with plate obturators without teeth, secured to standing teeth or utilizing part of the floor of the nose for support. These should be placed as soon as possible after the operation. More severe defects demand bulkier appliances which can be made hollow. Contact with the nasopharynx should be above the area of the pharyngeal muscles. Bilateral resection of the maxillae leaves only front and rear rims of tissue. The anterior section carrying the extension on to this rim can be made to rotate to permit insertion. Leaking of fluids into the nose

during swallowing can often be controlled by a tapered perforation from the posterior nasal surface of the obturator to the oral margin of the appliance in the premolar region, through which the liquid can return to the mouth.

After resection of the mandible, translation of the remaining fragment and formation of scar tissue make it very difficult to get a good result cosmetically. Pre-operative casts must be made and temporary retainers inserted immediately post-operatively. The aim is to enable the patient to control the fragment, and buccal flanges, guide planes, and pseudo-temporomandibular joints and similar devices must be employed according to the necessities of the case. Abnormal rotation in the remaining temporomandibular joint is a frequent cause of pain. Double lever devices to maintain the upper and lower appliances in position are described. Acrylic prostheses for ear and eye replacements are also mentioned.—ACKERMAN, A. J. (1955), *J. pros. Dent.*, 5, 413.

Manipulation of Inlay Wax

Inlay wax may be softened in a water-bath (Hollenback) or by means of dry heat (Skinner). The latter considers that the hot-water method causes the liquid portions of the wax to leech out into the water. The softened wax must be maintained under pressure in the cavity until it has set and this end may be achieved either by carrying the wax to the cavity on a metal matrix band, removing and resoftening, and replacing, or by using a cone of wax with a hard centre. Metal bands have the disadvantage that their conductivity causes rapid cooling of thin sections of wax and consequent deficiencies on the gingival and labial margins of the pattern. The wax is allowed to cool to mouth temperature before carving is commenced; this should allow for the maximum release of strain in the wax. The carving is carried out with sharp instruments; the direction of the carving near the margins should be parallel with them. The surface is made as smooth as possible and

polished with linen strips and damp cotton-wool.

Keys has studied the question of sprueing and his table shows a range from 1 mm. or 16 S.W.G. sprue for a 16-gr. casting to 2 mm. or 12 S.W.G. sprue for a 48-gr. casting. If multiple sprues are used the total cross-sectional area should be greater than that of the relative single sprue. They should be $\frac{3}{16}$ in. to $\frac{1}{4}$ in. long. The pattern may be sprued while in the cavity or after it has been removed with a fine probe. Schwartz says the sprue should be cylindrical and not tapered; it should be sufficiently large that the molten metal within the sprue space will not freeze until after the casting proper has completely solidified—it should be attached to the bulkiest part of the pattern, and if there are two bulky parts there should be two sprues. With the sprues mentioned above reservoirs are not required.—HUMFORD, G. (1955), *Dent. J. Aust.*, 27, 109.

Experimental Occlusal Trauma

Four Rhesus monkeys had high M.O.D. inlays inserted in the 5s. The monkeys were killed at 3 days, 3 weeks, 3 months, and 6 months. Kodachrome photos, X-rays, and the premolars on the opposite side of the mouth were used as clinical checks and histological controls.

The author describes the histological features found on the experimental side

and then discusses and contrasts the work of Stones.

He concludes that neither clinically nor histologically does the gingivæ show any sign of gingivitis, periodontitis, recession, festoons, clefts, pulp stones, erosion, or caries.

Occlusal trauma, however, does cause necrosis, resorption of bone, thrombosis, root resorption, and then later repair. The histological changes that occur in occlusal traumatism are reversible and non-inflammatory.—BHASKAR, S. N., and ORBAN, B. (1955), *J. Periodont.*, 26, 270.

DENTAL RADIOGRAPHY

A two- or three-days course in Dental Radiography has been arranged for dental nurses and assistants to take place on Monday, Tuesday, and Wednesday, March 26–28, at the Ilford Limited Department of Radiography and Medical Photography, Tavistock House North, Tavistock Square, London, W.C.1.

Lectures will be given in the mornings from 10 a.m. to 12.30 p.m., and in the afternoons of the first two days from 2–3 p.m. The rest of the time during the three afternoons will be devoted to practical demonstrations given on the X-ray units and in the darkrooms.

No fee is charged for this course. Application forms will be sent on request.

CRITICS' CORNER

(Under this heading we print letters which discuss points arising from articles which have appeared in the DENTAL PRACTITIONER)

To the Editor.

Dec. 29, 1955

Dear Sir,

Every one of your readers is aware of the difficulty in finally selecting the material which so successfully captures our interest from month to month, but you will get more sympathy than appreciation from most of us for the inclusion of the article appearing on pages 120–121 of your December issue.

An explanation of the process of attaching extracted teeth to artificial dentures is rightly

encountered in the catalogue of a Dental College Museum and is out of place in any progressive journal such as yours.

Small wonder that we are still asked whether or not extracted teeth are used to make false teeth.

Yours in good faith,

ROBERT FITZSIMONS.

The White House,
52, High Street,
Penge, S.E.20.